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BRIEFLY TOLD.

THE MEETING AT TOLEDO.—"*Toledo, O., March* 19, 1890: Dear JOURNAL—Writing hurriedly at this hour, which marks the conclusion of the first days' business session of the Sixth Annual Meeting of the (I had almost written Baby Association, but fortunately remembered in time that Texas and the Southwest held the junior honors) lusty Ohio Association, I may say that it seems scarcely possible that a twelvemonth has been added to history since the last gathering, at Mansfield. Time has dealt kindly with its membership, in that the roll of a year ago remains intact, although the grim reaper has been exceptionally busy in the ranks of other Associations. You may depend upon it, however, that the death strokes which afflicted them have also awakened strongly in the breast of the Ohio Association that sympathy which kinship of the truest sort alone can call out. The cutting off of such men as King, Forstall and Cushing must be felt by all; and strongly, too. Indeed, I ought not dwell longer on this, for President Lindsley, in his annual message has alluded most appropriately to the matter. Many of the delegates came in last night, and it is but common justice to the Secretary and the Local Committee of Arrangements to say that their joint efforts for the accommodation of the visitors were of the most satisfactory kind. The Boody House presented the appearance that such hotels always take on when they have been selected as the trysting places of the gas men. I do not know whether such an impression is the general one, but it always seems to me that gas men, whenever assembled on like occasions, look as if the world had used them kindly. The prevailing personal characteristics are: More than the average height, well above the average avoirdupois, and well beyond the average age. There is no gainsaying the fact that gray hair is fashionable at the Association gatherings. Not that the ubiquitous youngster does not also have a chance to show himself. He is there, but is usually not forceful. The first day's proceedings were marked by much earnest work, and President Lindsley proved that he is not only a good gas maker, but that he is a capable director of conventions as well. The attendance was perhaps not far short of 60, and there was a goodly contingent of visitors, including not a few from the East. Secretary Butterworth was more than pleased at this response to his earnest preliminary work, and Charlie Faben beamed with smiles—and a jolly smile is his. Few appreciate the real sacrifice that President Lindsley had to make in preparing for his duties in connection with this meeting. Severe illness in his family, with all that that implies, was his portion, and with rare fidelity to the Association's interests he served in double harness, without complaint. Is it any wonder that the Association prospers when its members make such sacrifices on its behalf? His address was of the practical sort, and his remarks in respect to the varied influences for good that mutual association has upon the gas industry are vigorous and bright. Take it all in all, it is a good paper, and will well repay a careful reader of its lines. As to the regular papers, they bore out the promise of their titles. Faben, as usual, in his treatment of 'Graduated vs. Uniform Rates,' was frank and outspoken. In fact, it seems to me that the single scale theory finds fewer advocates every year, and as the average rate for gas decreases, I think the chance for argument in favor of the all-round rule grows smaller. One of the best papers yet presented by Mr. Wilkiemeyer (and that is saying much, for everything that can be

traced to his pen in the shape of communications to the Ohio Association have been really models) was his compilation on the subject of the 'Municipal Control of Lighting.' Of course I cannot go at length into it; but let me quote a single sentence—not exactly as he wrote it, but so arranged that I can carry the meaning through without taking up too much space—in order to show the aptness of his reasoning. The lines are these: 'The capital of a city is derived primarily from the pockets of the people; secondarily, from the vaults of the city treasurer. It is not an exercise of solid political economy to allow the people's money to be invested in a commercial undertaking," and "no man should be willing to be taxed in order that a city should secure capital with which to strangle private enterprise." If the political stranglers who are now agitating for the supply of gas and electric light by the cities and towns of Massachusetts could, through the medium of the constituents whose interests they misrepresent, be shown the potency of this argument, they might not be so willing to engage in an attempt through corporate force "to strangle private enterprise." Labor cannot look to its just due from public employment, for private capital has always been its savior. The paper by Mr. Hyde, Sr., on the new coal gas works at Cleveland, is after the manner of its author—precise, cool and accurate. To me, however, the moral of it all—and I think his view will be shared in more fully, when a score or more of Utopian fuel gas schemes have been exploded—is contained in its closing words. Having said that in his opinion the new Cleveland plant was of the best type, he quaintly remarks, "And is well provided to *produce* the *most effective gas fuel*, as well as the most practical medium of artificial light." In other words, the engineer of the near future will not require two plants for the manufacture and distribution of lighting and fuel gas—any more than he now does. Given a perfect manufacturing plant, his next step is to improve to the full the methods of using the product. The point of consumption is the one for the sharpening touches of the student and the inventor. Mr. Light's paper on the "Advantages of a Combined Coal and Water Gas Plant," strongly favors the affirmative side of the proposition; and Mr. Hedge's "Street Lighting Statistics" bears the evidence that care, thought and correspondence accompanied its compilation. The statistics are given in neat tabular form, and are likely to be hoarded for reference by all those who shall read his paper. I have not heard the remaining papers listed, but these will, of course, appear in due season, as will the contents of the "Question-box," which have been greatly increased since the publication of your last "Official Notice." The gas apparatus exhibition is a good one, and cannot fail to result in material benefit to those who have goods on display. The arrangement of it is admirable. To-morrow will be occupied largely in paying visits to the exhibition, to the showrooms and factory of the Central Chandelier Company, and to the plant of the Toledo Company's gas and electric light works. In conclusion, I may say that the Ohio Association's course is still onward and upward.—***"

"*Thursday*, 8 P.M.—The remainder of the proceedings may be classed as on a par, at least, with what I sent you respecting the instalment of the first day. The Association roll was increased by the addition of no less than 30 names, and this fact tells the story of the Society's vitality. It has been decided to hold the next meeting at Zanesville. The officers elected are: President, Chas. R. Faben, Jr.; Vice-President, H. Wilkiemeyer; Treasurer, Geo. W. McCook; Secretary, Irvin Butterworth—a right good working staff. The interest in the meeting was well sustained. The outing time was not over-enjoyable; and the banquet was as it should have been. Permit me to remark in closing that Lindsley is a most capable hand at directing the affairs of a meeting.—***"

A Weekly Edition of the Electrical Engineer.—It gives us satisfaction to be able to say that the *Electrical Engineer*, hitherto published in this city as a monthly review of theoretical and applied electrical science, will, from and after April 1st, be printed weekly under its former management. This paper was conducted in a manner peculiarly acceptable to the interests which it represented, and as an earnest that this course is to be pursued in its entrance upon a wider field, we have only to remark that its old-time conductors, Mr. F. L. Pope and Mr. G. M. Phelps, are still to remain at the helm. They have, however, associated with them Messrs. T. Comerford Martin and Joseph Wetzler, whose names are guarantees that what was good before shall be even better in the future. We hope that the *Electrical Engineer* will reap the reward that comes from honesty of expression and unprejudiced treatment of the interests it seeks to serve.

Mr. William H. McClave, of Newark, N. J., died at his home in that city on the morning of the 15th inst. He had been a resident of Newark since 1850, and was a Director in the East Newark Gas Company.

Mr. Greenough on Municipal Light Supply.—At an adjourned meeting of the Committee on Manufactures (Massachusetts Legislature) Mr. C.P. Greenough appeared in argument against the Bowers proposition to authorize the municipal authorities of cities, towns and villages to engage in the supply of artificial light. He declared that the proposition means spoiliation by the Nationalists. The bill submitted contains no provision requiring the purchase of the gas companies, an omission which means ruin to the companies and to their stockholders. The scheme involves socialistic tyranny, and the petitioners do not represent the people, but only that portion of the people under their own hats. Mr. Greenough said that no cities, or towns ask for this legislation; it was only a part of the programme laid out by the Nationalists to place the railroad, telegraph, express and all other business in the hands of the Government. The proposed legislation was calculated to tempt towns to engage in speculative enterprises, and it would prove a source of political jobbery here, as it had in Philadelphia, Richmond, Wheeling, and elsewhere.

President Peaty's Views on the Status of English Lighting Methods.

The following is abstracted from the annual address of President Henry Peaty to the Midland Association of Gas Engineers:

During the past year, many things have happened which compel us to examine seriously the conditions of stability of our gas undertakings. Our rivals, if they have not actually increased in number, have developed in strength and activity. Some of them may be passed by without much consideration; to others, we must give our respectful attention. The language used formerly in describing electric lighting, and in estimating its value and prospects of success, must be considerably modified. Many of the defects which have been pointed out in past years, no longer exist; and those that remain have the attention of accomplished engineers, who are exerting every energy to effect their removal. We can no longer speak of the impossibility of bringing the light down to an illuminating power that would be generally useful; that it does not admit of regulation; that it is variable and uncertain (I am now speaking of the glow lamp supplied from accumulators); and that the color is more trying and wearying to the eyes. In many respects, it is a most beautiful light; and the way in which it can be adjusted to any portion of a room—ornamenting as well as illuminating—commends it to those who have a delight in beautiful adaptations, and who are not confined to the economical aspect alone. At present, it cannot compete with coal gas in economy; it is to some extent a light of luxury. But many people like luxurious appliances, and can afford to have them. There is such a thing as fashion. What is fashionable will be sought after; and, in many places, good and useful as gas has proved itself to be, and still is, the newer light will find a place. The gas will be removed, or relegated to the humbler offices of the house or mansion. Any one who has money and taste enough to adorn his principal rooms with valuable pictures and other decorations, would not hesitate to illuminate them, wherever practicable, with the light that would least interfere with their valuable contents. I do not anticipate that this method of lighting will take a large proportion of the lighting business of the country; but it is almost sure to encroach somewhat on our domain, and we shall have to bestir ourselves to make good any loss that may occur.

The use of oil lamps is extending; and though there is some inconvenience in the trimming and some risk, many prefer oil lamps to gas on account of their soft and agreeable light. It is claimed for the oil lamp that the light is cheaper, the wonderful improvement in burners enabling the consumer to get a most agreeable illumination at a moderate cost. The fittings have been improved to a remarkable extent; many of the designs of fittings, glasses and shades leaving nothing to be desired in the matter of decoration. Many of these fittings are cheap; and being portable, they are bought by consumers who would not go to the expense of gas fittings in their dwellings. The way in which we may compete for the custom of this class of consumers will be dealt with further on.

Of water gas—either used in manufactures, or in conjunction with oil gas for the purposes of illumination—I do not entertain the slightest fear. Whenever the conditions of the oil market allow gas to be made so as to compete with our ordinary coal gas, no one will be in a better position than ourselves to make use of it and supply it to the public. At present there is no firm of importers of oil who can quote a low enough price for either British, American or Russian oil to enable us to work it economically. When the supply of oil is sufficiently copious and low enough in price we shall be able and willing to deal with this mode of manufacture.

OFFICIAL REPORT.—REVISED BY THE SECRETARY.—[CONCLUDED FROM PAGE 362.]

TWENTIETH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD AT YOUNG'S HOTEL, BOSTON, MASS., FEB. 19 and 20, 1890.

SECOND DAY—FEB. 20—MORNING SESSION.

REPORT OF COMMITTEE ON PRESIDENT'S ADDRESS.

Mr. Lamson—The committee to whom was referred the President's address would report as follows:

The committee heartily recommend to the Association a careful consideration of the many valuable and interesting matters contained therein. They coincide with the President's views in regard to the fairness and courtesy always displayed by the Gas Commission, and the value of the services of that body, both to the public and to gas companies. They respectfully refer back to the Association, without report or recommendation, that portion of the address advising the appointment of a committee by the Association for the consideration of legislation, etc. They further recommend the printing of at least 250 copies of the address for distribution among the members of other societies.

FRANK S. RICHARDSON,
CHAS. D. LAMSON,
HENRY B. LEACH,
} Committee.

Mr. Lamson (continuing)—In presenting this report I would like to say that I am not the chairman of this committee; that Mr. Richardson is the chairman, and that I was asked to present it for the reason that I yesterday afternoon felt called upon to make a few remarks with regard to a part of the address; but I want this morning to commend this address most heartily to the Association, for I believe that it is written exceptionally well, and will prove a valuable paper for future reference. I also want to say a word with regard to two points mentioned in this report. First, the Gas Commission. They have been referred to by the President in pleasing terms. I most firmly believe in the Gas Commission, and in the value of their work. In a general way I have believed that their work has been in the right direction; but I feel rather called upon to draw the attention of the Association to one matter which I understand they have in their report, and which they are bringing before the Legislature at this session. Last year there was legislation in the matter of the limit of the amount of carbonic oxide in gas. The limit that has been allowed in Massachusetts is 10 per cent. After much legislation last year it was left in this manner—that the limit should be 10 per cent., but the Gas Commission were allowed to increase that limit if they saw fit, if, when they granted a license to increase the limit, they would guarantee the safety of the gas which contained the increased limit. No three men would assume that responsibility, and no license has been granted. If I understand the recommendation of the Gas Commission to the Legislature this year it is something like this—that the Gas Commission generally shall have power to grant licenses to manufacture water gas in various towns in the Commonwealth, the limit of carbonic oxide being something like a sliding scale. That they may allow town A to manufacture water gas with a limit of 10 per cent., town B with a limit of 15 per cent., and town C with a limit of 20 per cent.; that they shall use their careful judgment in the supervision of the matter, and that they may at any time, if they see good and sufficient reasons, revoke the license and prohibit a corporation in a town from making water gas, and I suppose refuse the right to make it, or the right to make it under the limit which they have granted. Of course, this Association can pass no resolution, or take any action to influence the Gas Commission, and do not wish to do so; but I wish personally, in making the report and in speaking of the Gas Commission, to draw attention to that matter, and to this particular bill which they are introducing before the Legislature. It seems to me that all our Legislatures would do well to act in this matter, and to place a decided limit upon carbonic oxide. What that limit should be I am not prepared to say; but whether the limit be left at 10 per cent., or increased to 15 or 20 per cent., I believe that it is for the good of the companies in Massachusetts, and also for the good and happy contentment of the Gas Commissioners for the years to come, that the limit shall be established by the Legislature and not by the Gas Commission. It will bring no end of trouble if the Gas Commission are going to allow one of you gentlemen to make 20 per cent., and limit another to 10 per cent. of carbonic oxide. They would hardly have time to attend to any other business during the year. I hope that when the question comes up, and they present it to the legislature—as they are supposed to be called upon to do very soon—they will see that it is a wise thing for them, and a good thing for the companies, that they recognize some one limit that is, in their judgment, the right one, and let that limit be the same for all. In the latter part of this report of the committee we refer back to you the suggestion of the President that a committee be appointed to look to the question of legislation and to help out in the matter. I most firmly believe that the Association, as an Association, should let legislation alone—that they should not in any way, shape or manner touch it; but let each one of us in the towns where we live watch the legislation and do what we can to influence it. But as an Association, I think that we would make a great mistake if we should in any way try to influence the legislation of this State.

On motion of Mr. Stiness the report was accepted and placed on file.

The President—That matter being left in that shape, no further action is necessary. A matter similar to that has been brought to the attention of the President. It is with reference to the preparation of statistics for a census report; and perhaps without entering into a discussion of the matter, if Mr. Foot, the special agent of the Census Department, is in the room, or Mr. Graeff, will explain to us what action individual companies may be asked to take with reference to that matter, we should be glad to hear them.

Mr. Graeff—I do not know that there is much to explain. The only point which I desire to call to your attention is a matter in which I think every member of the Association is as intimately concerned as is any government official. This will be the first time the gas industry will be represented in the census of the country. An attempt in this direction was made 10 years ago, as you know, but unfortunately Major Dresser died before his work was completed; and consequently the gas industry stands as yet unrepresented as regards statistical data. I think it is to the interest of every manager, superintendent and engineer who has the good of his business or profession (as you may choose to call it) at heart, that the best possible showing, consistent with strict facts, shall be made. I would only ask that each of you consider and bear closely in mind the fact that nothing which is sent in to the Census Office will be made public in any way. The schedules sent out will contain some questions which you might consider impertinent, provided any publication was to be given to them; but there will be no way by which Mr. Taber can find out anything that Mr. Harbison has been doing, or by which Mr. Humphreys can find out how Mr. Prichard is making gas. The figures will simply be entered as statistics, and the nearest approach to a division will be by States. Therefore I ask you to bear in mind that all the statements which you may make, and all the answers which you may give, will be treated as strictly confidential—not merely so by the census enumerator as a man, and as one of yourselves, but by the other sworn officials of the government, who could not divulge them even they wished to. I think if that fact is borne in mind there will be no difficulty in obtaining the showing which the gas industry is entitled to. That is the only point I wish to bring before the Association.

Mr. George F. Goodno, of Dedham, Mass., then read the following paper, entiled

A POINT OR TWO IN REGARD TO ILLUMINANTS DURING CONDENSATION AND PURIFICATION.

It is with diffidence that I come before this body of experienced men to acquaint them with facts with which they are doubtless familiar, but in working up the subject I have gained considerable information myself, which may be some excuse for inflicting this upon your attention.

A phase of the question of the advisability of using iron sponge for purifying purposes has led to the assertion, supported by some short experiments, that lime absorbs quite an appreciable portion of the illuminants, thereby reducing the quality of the gas so purified to the same candle power as that purified by sponge with its contained carbonic acid. No one has ever held that there is any chemical combination between lime and the illuminants, any more than there is between sponge and the illuminants. If there is *any* absorption, it must be purely mechanical in either case, and there appears to be no reason why one should absorb more than the other.

A well-known engineer has shown by a series of careful experiments, on an average quality of gas, that the candle power is reduced about one candle by the presence of 1.32 per cent. of CO_2 in the unpurified gas, or what would be the same thing in regard to the CO_2, that purified by sponge as against that purified by lime. I endeavored to attack the problem from a different quarter, after the the following manner:

Four or five cubic feet of unpurified gas were stored in an improvised holder made from an old governor. A portion of this was passed through a layer of good, fresh sponge about one foot thick, and a sample collected for analysis. Another portion was passed through a like quantity of moistened lime, and a sample likewise collected for an-

alysis. By this means there was no doubt that the composition of the crude gas before either method of purification was the same. This can be readily seen to be a most important point, and one not strictly observed in other experiments on record.

The analyses made were to determine the amount of carbonic acid and illuminants only. The apparatus used was the Hempel, which was exhibited to you last year, and its use so clearly demonstrated by Mr. Jones. It meets the requirements of an experiment of this kind in a very satisfactory way.

The sponge gas was treated precisely like the lime gas in regard to temperature of operation, length of contact with the reagents, etc., so that any error occurring in one would appear in the other, and would not affect the relation between the analyses.

The samples were taken over a period of six weeks, as will be seen by the dates, and comprise a very wide difference in per cent. of illuminants. Taken as follows:

	CO_2.	Illuminants.
Nov. 1.—Unpurified gas.....	1.0	4.1
Purified with lime	0.1	4.1
" " sponge.....	1.0	4.1
Nov. 2.—Purified with lime	.0	4.1
" " sponge	1.0	4.1
Nov. 8.—Purified with lime	.0	3.5
" " sponge.....	.5	3.7
Nov. 10.—Purified with lime	.0	6.7
" " sponge.....	1.8	6.7
Nov. 15.—Purified with lime	.0	8.0
" " sponge.....	0.7	7.9
Nov. 21.—Unpurified gas.....	.8	5.1
Purified with lime	.0	5.1
" " sponge.....	.8	5.1
Nov. 23.—Purified with lime	.0	6.2
" " sponge	.6	6.2
Nov. 28.—Purified with lime	.0	6.7
" " sponge.....	.5	6.8
Dec. 14.—Purified with lime	.0	4.8
" " sponge.....	.6	4.8

A glance over these results shows the amount of illuminants in percents. by volume to be practically the same whether purified by lime or sponge. But the candle power does not vary with the percentage by volume of the illuminants, for at least two reasons, viz.:

First, because of the different specific gravities of the various illuminants, belonging as they do to the naphthaline, benzole, and other series of hydrocarbons. Some authorities have said that the candle power varies according to the percentage *by weight* of the illuminants; and this looks much more probable when we observe the different specific gravities of those constituents:

Acetylene	.89
Olefiant gas	.97
Benzole	2.72
Naphthaline	4.42

A very limited variation in volume of the last two would make, as will be seen, a very considerable difference in candle power. In fact it seems, from a study of a large number of analyses, that the volume per cents tell us very little about the illuminants and the illuminating power of a gas.

The second reason is the influence and character of the accompanying diluents, as shown by the reports of the State Inspector. Two analyses in these reports show this fact very conspicuously.

	Candle Power.	Illuminants.	Marsh Gas.
No. 1.....	19.4	5.14	45.12
No. 2.....	16.6	9.20	30.61

In the first the low per cent. of illuminants compared to the candle power and the remarkably high per cent. of marsh gas. The hydrogen was nearly the same in each. The per cent. of illuminants in the second being nearly double that in the first, while the marsh gas is only about two-thirds. Another factor in the case is that No. 2 contained 12.3 per cent. of nitrogen and 2.2 per cent. of CO_2, while No. 1 had 3.5 per cent. nitrogen and no CO_2.

Furthermore, the 19.4-candle power gas was purified by lime alone, while the other evidently was purified by sponge—as a whole, quite clear negative evidence with regard to the absorption of illuminating power by lime.

Another point in which I became interested with regard to absorption of illuminants of the gas is in its passage through condenser and washer. Our condenser is a coil of pipe exposed to the air, and the washer a rectangular iron box, with alternate shelves, and is familiar in small works.

I wished to determine if there was any loss of illuminants to the gas in its passage through these two pieces of apparatus, especially when there was a relatively large amount of water running through the washer. For this purpose a sample of gas was taken after passing through the exhauster; then, by a rough calculation of the capacity of the apparatus between there and the outlet of the washer, I determined very nearly by consulting the meter when the same gas could be sampled again. The two samples were then analyzed for illuminants. Several pairs were taken in this way, and different qualities of gas on different days. The results were as follows:

	CO_2.	Illuminants.
Before passing condenser and washer.....	1.4	4.3
After " " "	1.4	3.9
Before " " "	1.5	5.6
After " " "	1.5	4.9
Before " " "	1.0	4.1
After " " "	1.0	3.8
Before " " "	2.0	6.1
After " " "	1.8	5.7
Before " " "	1.4	4.3
After " " "	1.4	4.3
Average loss.....		.36

I was then using about 4 or 5 gallons of water to the 1,000 cubic feet. The pressure of other duties prevented me from making further analyses, using less water, as I intended.

Discussion.

The President—You have the figures and the facts before you. Has Mr. Gifford any figures which he can compare with those given by Mr. Goodno?

Mr. Gifford—I have no figures, but I will say that I am pretty certain from my observations that these facts are very generally true, and in a good many cases the percentage is a great deal larger than he has stated.

Mr. Prichard—This paper is valuable in settling in my mind a point which has been often spoken of the relative absorption of illuminants in oxide and lime. I have in mind two papers, both taking opposite and different grounds from this paper; and it seems to me, from the care that Mr. Goodno has taken in his experiments, he proves that both those gentlemen are wrong; and he settles in my mind that there is no absorption of illuminants by the purifying material.

The President—I know it has been the prevailing idea that the use of iron sponge was a detriment to candle power. Has any one made any experiments to prove how much of a detriment it is?

Mr. Jones—I think that Mr. Goodno's paper is a valuable addition to the literature of gas purification. He has voiced an opinion which I have had for some years with regard to this matter; but my good friend Mr. Blodget, of Williamsburgh, tried a series of experiments, the results of which he put in the form of a paper and read before the American Association, which were directly contrary to Mr. Goodno's results. Granted that the absorption of illuminants by the passage through the lime is merely a mechanical action, I see no reason why 12 inches of lime should absorb illuminants, if 24 inches of sponge, closely packed together, does not absorb the illuminants. I have a few figures here which relate to another portion of Mr. Addick's paper, but which I think may be of interest. Last spring I was using at the North End station of the Boston Gas Company what is known as the Baby process—the bootleg retorts. We used the process for enriching our coal gas, using oil and steam in the presence of incandescent lime. I found that there was some loss by not running the water gas process on Sunday, on account of cracked retorts, etc.; and so I decided to run the water gas plant on that day. This gave me oil gas, which I put into the holders and mixed up with the coal gas of low candle power which was made during the early morning hours of Sunday. I thus had an opportunity to find the difference in candle power between the unpurified oil gas, and the condensed, washed, and purified oil gas as it went through the station meter of the works. It has been very aptly said that no man knows what there is in a gallon of oil, and I believe that that is true today. I hope that some day we will find out what there is in a gallon of oil, and naphtha as well. I have some figures giving the candle power of crude oil gas made in the bootleg retorts directly after it had passed a washer which was inadequate for the purpose, and the candle power after it passed through the station meter. One hour the candle power of the crude gas was 24.5, and at the station meter 21.5; the next hour the crude gas was 24.5, and the purified gas 21.5; the next hour, crude gas 23, and the purified gas 21.5; the next hour, crude gas 23, and the purified gas 20; showing that there was a loss of about 3 candles in fixing that gas in order to send it out to our consumers. Is there not some way

that we can get that 3-candle power back into the gas and deliver it to our consumers as it should be?

The President—Can anyone answer that conundrum?

Mr. Harbison—I suggest that Mr. Jones tell us next year at what points this loss occurs, if at more than one point, between the bootleg retort and the station meter; and if he will make his test at various points between those two points I think he will be able to solve the question.

Mr. Addicks—I would suggest the possibility that the loss is before you get to the scrubber and washer at all. In other words, that it is by reason of not heating the gas to a proper temperature.

Mr. Humphreys—We have been making some experiments in this same line, and I am sorry that I have not the exact figures with me. We make, as you know, a mixture of coal and water gas, and have been endeavoring to see whether there is any loss of candle power in the passage of the gas through the works. We have been making these experiments now running over three weeks, taking the candle power and analyzing the gas at points next to the hydraulic main, and prior to the condenser, and prior to the washer, and prior to the purifiers; and we do not find any loss either in candle power or in illuminants in the passage of gas through the works.

Mr. W. A. Wood—Have any members noticed a difference of candle power when using fresh sponge and when using old material? Our experience has been that when running on old sponge which has been used for several months we get a certain candle power, but if the box were filled with new material there would be a depreciation. There is a question in my mind whether the more active sponge does not effect some chemical change in the illuminants themselves.

The President—Possibly the greater heat of the reaction of the iron itself at its first start off might depreciate the illuminants.

On motion of Mr. W. A. Wood, the thanks of the Association were voted to Mr. Goodno for his paper.

The next paper was read by Mr. W. H. Snow, of Holyoke, Mass., entitled—

A CHAPTER OF DON'TS.

Mr. President and Gentlemen:—During a somewhat extensive experience in the past twelve months with an old stack of benches, some faults of construction were so forcibly brought to my notice that I jotted them down for future reference, in order to guard against a repetition of same in case of possible rebuilding. When the invitation came to prepare a paper for this meeting I wrote them out more fully, hoping some one might get a point or two for his benefit. The points are put in the form of "dont's," as the writer does not wish to undertake to say what is the best way of obviating the faults. While he may have his own opinions in the matter, he prefers to leave the solution of the questions to the judgment and discretion of his hearers.

There is no portion of a gas works that it is of more importance to have well constructed than the stack of benches, with the bench settings. It is a case where the cheapest is not always the most economical. Sometimes in building a new stack a few hundred dollars invested above absolutely necessary expenditure will be returned more than a hundred fold. To begin at the beginning, look well to the foundations; don't neglect them; don't under any circumstances have them weak. Those who have never been there have no idea of how the heat strikes down through them. In excavating the past season to put in some deep furnaces under an old stack, it was surprising to find how hot the earth was under a bench that had not been run for a month, and had all been torn out for two weeks. The foundation was a solid block of masonry 3 feet in thickness, built of flagstone 6 and 8 feet long by 3 to 5 feet broad, and from 6 to 9 inches thick. The dirt was so hot for a depth of 3 feet under the flagging that it could not be handled until it had been cooled; in fact, it was sissing hot when water was run upon it. You probably are all familiar with the instances where bench work has been built upon piling, and the piles have burned off so much as to ruin the stack. The stones themselves get so much burned that they appear like rotten stone one can pick up in the fields; hence it is necessary not to have the foundations too thin. Don't use poor flagstones; anything or everything will not do. An expensive foundation is a good investment.

Next comes the brickwork, the arches and their covering. Don't scrimp on room. Don't be satisfied with low, narrow, shallow arches. There seems to be a growing demand in every succeeding year for more room in the retort house. Do you realize the economy in fuel and labor secured by large retorts? I have frequently seen a bench, with all the coal it was practicable to put into it, so hot that if there had been room to put it, it would have easily burned off 25 or 50 pounds more to a retort with no more expenditure of fuel or labor. If plenty of room can be had, next look sharply after the brickwork. Don't accept any second-class bricks, don't allow any large joints, and don't have any red bricks anywhere near a flue. Have you ever, in the case of a stack that had settled and apparently shrunk, and appeared upon the point of collapsing, investigated the causes therefor? Were there not some soft burned brick, broken and ragged from the handling during the transportation, somewhere in the structure, either just at the top of the foundation, or in the piers supporting the arches, that were not strong enough to stand the strain of repeated contraction and expansion, and had crumbled, helping on the settle? Were there not places, perhaps out of sight, where there had been large joints? In leveling up, had not the masons, rather than spend the time and trouble to cut bricks to fit, filled up the spaces with a half-inch or more of mortar? There is but little strength or bond in fireclay mortar, so with large joints the conditions are even more favorable for settling than in the case of soft bricks.

Red bricks are another prolific source of trouble. My advice would be, don't use any, either in leveling up the foundations or filling up over the arches. By no means have any near the flues. While their use may have been perfectly practicable in the days of common old-style furnaces with lighter heats, with the changed conditions of the present heavy heats they will melt. How many of us have had occasion to cut from the bottom of the uptake flues a hard, lava-like substance, and traced the cause to the same red bricks? When they melt and run they must of necessity leave an empty space, to the detriment of the strength and stability of the block. I have recently seen on top of a stack with short chimneys a hole where the bricks had melted, extending from chimney to chimney, a distance of 17 inches, a foot wide and 15 inches deep. The safety of those chimneys was certainly jeopardized.

Don't by any means ever allow the tie-rods connecting the binder irons to be covered by the brickwork. They will most certainly burn off, the braces will spring out from place, and the arches begin to settle. What a feeling of discomfort possesses the manager when he observes this state of affairs and realizes that it is impossible to ever get them back into place again. I am glad to be able to state that the builders now-a-days appreciate this point and are keeping the rods uncovered.

There is a difference of opinion as to the desirability of short or tall chimneys. I will not attempt to say which is the better; but if the former are decided upon don't have them built directly over the up-take flues, What a source of trouble and expense such an arrangement is, those of you who have never had the experience have no idea. If it is in a double stack, the opportunities have to be watched for getting into empty arches to cut through back walls into the flues to clean them. With no such opportunity, there is a good chance of losing the bench before it is half used up. Be sure of a way of getting into the upright flues from the top.

After the stack is provided for there remains the most important part as affecting the results procured—the benches, the style of settings, and the furnaces. Don't put in old-style furnaces. It is positive extravagance so to do. It would be hard to tell which regenerative or recuperative furnace is the best, but it is safe to say any one of them is better than a common furnace. Our worthy Secretary requested me to write up my experience with recuperative furnaces; but my experience is so limited at present that I cannot give any facts or figures that would be of any real value to my hearers, though I am satisfied from it that no company can afford to heat their retorts in the old-fashioned way.

The first furnace we put in was in the fall of 1888, it being a half-depth recuperative one. With it we managed to burn our retorts all up inside of six months; but, notwithstanding this dismal result, we were able to gather some grains of comfort. The heat was there, the economy was there; we were on the right track. We found we must have a setting that would stand the great heat we could generate, as plain open settings would not do. With the retorts properly braced and protected, we could handle it. While the retorts were in good condition in this bench, we were able to make an average of 8,971 feet per retort, or 53,826 ft. for the bench in 24 hours, burning off 300 pounds of coal in four hour charges, with a consumption of 60 bushels of coke. We ran as high as 9,864 ft. per retort, or 59,184 ft. for the bench. The retorts were 14 in. by 26 in. by 9 ft. As was said, we were convinced we were upon the right track.

This last summer we excavated and put in three deep furnaces, starting the first one last October. We have burned off 2,000 pounds in four-hour charges, with a consumption of 60 bushels of coke in 24 hours (reckoning 59 pounds of coal as making a bushel of coke), making something over 60,000 ft. of gas to the bench, or 10,000 ft. per retort. Using 1,900 lbs. of coal to a charge is a comfortable every days' work, while 1,800 lbs. to a charge is only play. In this bench, the four upper retorts are 14 in. by 28 in. by 9 ft., and the two bottom ones are 14 in. by

26 in. by 9 ft. These furnaces are very simple recuperative ones, with both primary and secondary air supplies heated but very little compared with some of the more complex regeneratives.

Do we have any trouble with them? Yes, some. They require attention as well as common fires; but if the stokers were to be asked which style they preferred, they would undoubtedly choose these. We are able to run with clinkering twice a week; that is, either driving the secondary bars, or letting the fires down so that the fire-boxes can be cleaned all out. The latter we do upon Sundays, when not making gas, so we do not lose our heats. Of course, we run the slicing bars into the fires occasionally to break up the clinker. That is about all the trouble we have. The fires are very easily controlled; the labor of firing is comparatively light, as we fire with hot coke, so it is only a part of the charging. What have we gained? We have increased our make per bench from 45,000 ft. to 55,000 ft. per day. The latter figures are placed low purposely, as being a fair average for all the year around. We have reduced our coke consumption from 47 per cent. to 33⅓ per cent. These figures I do not give as anything wonderful, for they do not approach some that have already been given you in years past; but I consider them practical, every day results, that can be obtained with ease and comfort, without stopped stand-pipes or pitch in the hydraulic mains, and going to show the desirability of adopting some one of the improved methods of firing.

About the life of the benches I cannot say, as I have said, my experience is too limited; but if as much gas can be made under present arrangements in three months less time than formerly, adopting them will have been good business policy. There will be three months' labor that will not have to be paid for and three months' consumption of fuel saved.

If improved furnaces are adopted, look out for the settings; don't have them weak. Open settings, that will do for ordinary fires, will not answer for the increased heat. Do not allow bricks and tiles to be laid too wet; thereby avoid a prolific cause of cracks. The suggestions made at the last meeting of the American Gas Light Association, in answer to the question, "How should fire bricks and tiles be laid?" are good ones to follow.

I do not know that it ever has been done, but I believe it possible with sound foundations, first-class materials, good workmanship, plenty of room inside the arches, and the brick work properly braced and tied together, to build a stack of benches that will last a lifetime.

Discussion.

Mr. Allyn—As Mr. Snow has laid considerable stress on the matter of the economy in the consumption of coke, I would like to ask him whether he estimated his coke at the rate of 59 pounds to the bushel. It seems to me that that is a greater weight than any of us have ever reached.

The President—He estimates 59 pounds of coal as making a bushel of coke. The English find that a little over 60 pounds of coal produce a bushel.

On motion of Mr. Lamson the thanks of the Association were voted to Mr. Snow for his paper.

THE WORLD'S FAIR.

Mr. Prichard read the following report of the Committee on World's Fair:

The Committee appointed upon the World's Fair would report that they cordially approve the suggestion that the gas industries of this country be suitably represented at the proposed World's Fair; and they would recommend that Messrs. C. J. R. Humphreys, A. B. Slater and John P. Harbison be appointed a committee on behalf of this Association to act in connection with committees appointed by other Associations; and that such committee act without compensation, but that their actual expenses shall be paid from the treasury of the Association.

On motion of Mr. Stiness the report was received and accepted.

On motion of Mr. Neal the recommendations of the report were adopted and the committee appointed.

BADGES.

Mr. Stiness—On consultation, the Committee on Badges have decided to adopt the monogram of the New England Association. The Committee ask to be continued. They recommend that the badges be paid for by the members. It is perhaps proper that the badges be procured in the name of the Association, as it would be desirable for the Secretary to retain some in his possession. The price will not exceed $3, and we will get them for as much less as possible. I move that in this matter the Committee be continued, and that when they make a report they report to the President; and if acceptable to the President and Board of Directors, that they be authorized to procure the badge. I do not feel like throwing the responsibility of procuring the badges upon the Committee alone, without any consultation or advice.

On motion of Mr. Anderson the report of the Committee was accepted and the recommendations adopted.

QUESTION-BOX.

The President—I was afraid that, owing to the press of other business, our Question-box had been neglected. I was quite surprised the other day, on talking with some of the electric light gentlemen, that they alluded to the Question-box as one of the most interesting features of this Association. We can very well put in there questions as to anything which is troubling us, or as to which we are in any doubt, and get an answer to our queries. That seemed to the electric light men a wonderful thing. I will read the questions which I find in the box.

"*What is the effect on meters of the use of crude oil as an enricher?*"

Mr. Prichard—We find that when the oil is thoroughly fixed it has no effect that I am aware of.

Mr. Lamson—Crude oil has been used only for a comparatively short time, and I can hardly venture an opinion. We had all formed an opinion in advance with regard to the effect of naphtha on the meters—that it would be injurious; but I do not myself believe that it has been injurious to any great extent.

"*How many days is it best to allow for the payment of gas bills?*"

Mr. Fowler—In Westfield we wait 5 days.

Mr. Harbison—Five days, not counting in the day that the bill is delivered, Sabbaths or legal holidays.

Mr. Coffin—We allow 15 days, but about all the business is done in about the last two days.

Mr. Tilton—Ten days.

Mr. Coggshall—Ten days.

Mr. Allyn—Twenty-five days, with the addition of 25 cents per 1,000 after that.

Mr. Sherman—Ten days.

"*What dissatisfaction, if any, is caused among regular customers by making a reduction to users of gas stoves?*"

The President—As I understand that question, it is, supposing you allow a gas stove man to have his gas at one dollar, how much dissatisfaction is caused when he comes to pay for his illuminating gas at $1.50? Is the practice adopted in any of our New England gas companies of making a differential gas price on gas for illumination and heating?

Mr. Anderson—Our practice has been to charge $2.50 for illumination and $2 for stove.

Mr. Fowler—Is there any difference made in the price of gas for power and for illumination?

The President—I think there is no question about that. Who has gas engines in use?

Mr. Goodno—We allow a discount of 50 cents per 1,000 from the regular price for stoves, engines, etc., and we find that it is gratifying to the consumer; and it does not seem to react the other way and make him complain of the higher rate. I have not heard anything of that kind.

Mr. Harbison—I do not believe in the theory or principles of making a price for different uses of gas. I do not think that it ought to make any difference to the gas company whether the consumer uses gas for power or for heat, or for illumination. If you do make a difference in your price for different uses, you are making trouble with your customers. You make one man pay more who uses a large quantity for illumination than his neighbor pays for a small quantity for running his gas engine. If you begin to make a different price for the use of gas according to what it is used for, it increases the number of meters, and that is very objectionable on account of the expense involved. But you must do that in order to determine the quantity used. I think that both the principle and practice are wrong. I think that gas should be sold for all uses at the lowest possible rate.

Mr. Neal—I think it is a very good plan to make special rates for special consumers. We do it for gas engines and we never have had any trouble arising from it.

Mr. Coffin—We have three or four gas engines, but I believe that to the largest (a ten-horse power engine) we do not sell over three thousand feet per month; whereas we have some consumers who use three times that amount for illumination. I think that a consumer would have a just cause to complan that a party using only one-third the gas that he did could buy it a lower rate.

Mr. Greenough—I agree with Mr. Coffin. I do not think it is fair to discriminate against our principal consumers of gas for the purpose of

building up a trade. The question has been very carfully argued on the other side of the water; and in Brussels at the present time, I think, they have a meter which works in different compartments, according to the amount of pressure put upon it; and that for the gas used in the day time they charge one price, and charge another price for the gas used in the night. According to that plan, those who use gas in the day time get it for less money, and I think it is fair; but I think it is not right to turn against our principal consumers by selling gas to the small consumers for a less price. The question was brought up in the South Metropolitan Company, in London, and argued fully by Mr. Livesey, who maintained that the principal purpose for which gas was made was for illumination, and that if anybody was to get his gas cheap it should be the person who used it for light; and that to sell it to any one else at lower prices was to discriminate against the ordinary consumers in an unfair way. I must say that I think he was right in that view.

Mr. Coffin—We have in use over one hundred gas stoves, and last year they averaged a little more than $10 net, each; but after setting a separate meter, and doing all the additional work required, and then sell a party only $10 worth of gas per year, if we were obliged to do that at much lower prices than our regular price, it would seem to me to be bad policy.

Mr. Todd—I think the better way is to have a sliding scale, and let the largest user of gas, whether for illumination, power, or heating, have the biggest discount.

"*What is the best material and manner of repairing leaks temporarily in holders?*"

Mr. Coffin—I am using red lead, making it quite soft, one component part being shellac.

Mr. Allyn—I know of no better cement than one made of glycerine and litharge. It sets very quickly, is elastic in a measure, and after it has set it is very hard and very tenacious.

Mr. Anderson—I have had a little experience in this line. My holder, where the sheets were riveted together on the side, rusted out in places 8 and 10 inches long, so that the gas came out freely. The iron was so rusty and corroded that it was almost impossible to hold the cement on the sides. I took a lot of canvas duck and shellacked it, laid it over the break, tapped the canvas in the center so as to allow the gas to escape while the canvas was setting on the larger portion of the break; and after it had set closely on the holder I had no trouble in sealing up the small hole I had made in the canvas. It ran along for a year without trouble.

Mr. Harbison—Some years ago, during a severe snow storm, the top of one of the Hartford holders broke, and in coming down cut a hole in the side of the holder 16 inches long, five sheets from the top. We put a plate of iron on the outside, and it has remained there to this day in good shape.

Mr. Tilton—I have, during the past year, repaired one holder by soldering, where the leak was considerable. I first scraped the sheet, then thoroughly tinned it, and made a complete and good job by using soft solder. I have repaired a dozen different places on the holder in that way.

The President—Those are all the questions there are in the box. Are there any others which any one wishes to ask?

Mr. Addicks—I would like to ask for a method of preventing the gasfitter putting on 2-foot tips to save gas bills.

Mr. Coffin—One way to do it is to do your own fitting, and do it at such a price that the gasfitter cannot touch it.

The President—We get over that difficulty in the same way.

Mr. Harbison—I think if gas companies will provide a supply of burners that they can recommend as giving a good light for the quantity of gas consumed, and sell them to consumers at cost, they will have very little difficulty from any party putting on inferior burners. We have adopted that course and found it to work very satisfactorily indeed.

Mr. Lane—We have adopted the plan of furnishing the consumer with tips, and I think it pays to do so.

Mr. Anderson—I would like to ask the opinion of the Association as to what burner they consider the best to adopt to be sold to the consumer at cost. I have tried a number of burners of different kinds, and finally have come to the conclusion that the Bray burner gives the best satisfaction, and gives more light, for the amount of gas burned, than almost any other I have tried.

Mr. Addicks—We tested a large number at Chicago at one time, and found that they were apt to stop up.

Mr. Coffin—We adopted the Bray burner at one time, but found them hard to clean out.

Mr. Boynton—I would like to ask what is the effect of varying temperature and varying density in the registry of candle power upon the jet photometer. Perhaps Mr. Jones can tell us.

Mr. Jones—I have no figures at hand which I would like to give in answer to that question.

Mr. Prichard—I suppose the gentleman's question has reference to whether it is plain coal gas, or a mixture of coal and water, or coal and oil. I think that Mr. Jones can explain better than anybody else why photometers have to be adjusted for different densities of gas.

Mr. Jones—The jet photometer which I make is adjusted for all ranges of density, so that the instrument is approximately correct, as all photometers are. There is a great deal of dissatisfaction or fault found with photometers in general. The water gas photometer is of course made for a gas of greater density than coal gas, and is adapted to ranges of from 520 to 620; coal gas photometers are adapted to gas of a density in the neighborhood of 425, and oil gas photometers are adapted to gases of greater density.

Mr. Todd—I would like to ask what the members think is the best burner for street lights where there is a greatly varying pressure—say from 35-tenths to 25-tenths. The tips must be 4-foot. What is the best burner to regulate the pressure on street lamps?

Mr. Coggshall—The Springfield burner.

Mr. C. S. Spaulding—The city of Boston uses the glycerine burner, which we are using in Brookline; and after being on for three years, and having had a record kept, I know that they will burn within 0.02 of what they did when they were put on.

Mr. Harbison—Some years ago the city of Hartford was well lighted, as far as the streets were concerned; and at that time we were induced to put on a couple of dozen of glycerine burners for the purpose of testing them. They were 4-foot burners. We watched them very carefully, and in 20 days found that at least half of them were burning 10 or 12 feet.

Votes of Thanks.

The President—The papers which were prepared for us have all been read and discussed; the questions found in the box have been answered, and the work before us, so far as it was laid out by our absent Secretary, has been, as far as I know, thoroughly gone through. Unless some member has some business which would properly come before us, a motion for adjournment is in order.

Mr. Harbison—Before a motion to adjourn is made I wish to return special thanks, in my own behalf, and in behalf of the members of the Association, to our President, Mr. Taber, who has filled the chair at this session, and has performed the duties of his office during the past year to our entire satisfaction. He has been exceedingly courteous in his treatment of members, very thorough in his management of the business, very calm and deliberate in his judgments and decisions, and it is due to ourselves that we should place on record a vote of thanks to our retiring President, and I so move.

Mr. Stiness—I second the motion.

The motion was put by Mr. Prichard (President-elect) and unanimously adopted.

The President—Gentlemen, there ought to be a vote of thanks to you, rather than that you should give me thanks for doing what I have done so incompletely. I thank you most heartily for the courtesy you have extended to me. The absence of the Secretary necessarily threw a great deal of extra work upon us, and that he was not able to get here in time was a matter of regret to me; but your uniform kindness has enabled me to get through with the business. There has been but one subject brought up that has in any way tended to disturb us, and that has been treated in such a kindly way, and with such open, fair-hearted criticism, that I am very glad indeed that it came before us. I welcome it as a fact of a good deal of importance that we can criticise each other honestly, honorably and amicably, and state what we think, and why we think it. I have great faith in the future of this Association. I notice that our papers are getting more and more practical, more and more pointed, and that we are all getting more and more in earnest in the matters that come before us; and I trust this spirit may continue from year to year. I would remind you that we have had a Secretary *pro tem.* this year, who has ably filled the duties usually so ably managed by Mr. Nettleton; and I move that a vote of thanks be given to him for his kindness in attending to the duties of that office.

The motion was unanimously adopted by a rising vote.

Mr. Humphreys—I am exceedingly obliged to you, Mr. President and gentlemen, for your kind vote of thanks. I have recalled during the past two days our meeting at Baltimore of the American Gas Association, of which I am Secretary. You will remember that then, through illness, I was unable to take my usual place; but I received so much help from my friends at that time that the work went on without any

hitch, and that has made me all the more willing to serve you in the capacity of temporary Secretary during this convention.

PLACE OF MEETING.

Mr. Greenough—I move you that the Executive Committee of this Association next year consider the advisability of finding larger quarters for our meeting. The time was when the parlor of the Tremont House was large enough to hold us; then we came to this place; and now we have outgrown our present quarters. The ventilation of this room has been so poor that a number of our members have gone out because they could not stand it here any longer. I do not think there will be any difficulty next year in finding some small hall where we shall be more comfortable than here.

The President—I might say, in that connection, that in the proposed gas stove exhibition that we had on hand this year (and which was so heartily seconded by every maker of gas stoves), the great difficulty was in finding a place suitable. It was suggested in the course of the discussion that some such change as is now proposed should be made—not that we are anxious to leave our old home, for we are all familiar with this room, but because we are growing larger every day, and really need a larger room for our meetings.

The motion was carried.

The President—I wish to bring up something which has not been referred to yet, and that is that I think a vote of thanks is due to the local press for their fairness and care in reporting our discussions. It does not, of course, call for any response from them, but I will say that they have been very careful and accurate; and I think that a vote of thanks is due to them for their politeness towards us.

A vote of thanks to the local press was passed.

Mr. Harbison—It has been suggested to me that there has been no vote of thanks proposed, nor any fit announcement made with reference to the postponement of the entertainment tendered to us, and which has been postponed on account of the weather.

The President—That announcement was made in the early part of this morning's session, but I will repeat that, owing to the storm, it was not thought best to accept the invitation; but the thanks of the Association are due for the generous offer.

The thanks of the Association were voted to the companies extending the invitation.

On motion the Association then adjourned.

IN MEMORIAM.

The Committee appointed to prepare a memorial of our late associate,

MR. OLIVER E. CUSHING,

respectfully submit the following:

Oliver Edwards Cushing was born at Chelmsford, Mass., in March, 1829, and died in Lowell, Mass., January 17th, 1890.

He was one of the original members of the New England Association of Gas Engineers, and also one of the first Directors, but declined to accept the office of President.

He was also one of the original members of the Guild of Gas Managers, of New England, and served as its President two years. He was elected a non-resident member of the Society of Gas Lighting, of New York, in 1876. He was elected a member of the American Gas Light Association at its second annual meeting, in 1874, and continued his membership in these several Associations up to the time of his death.

He entered the service of the Lowell Gas Light Company as agent, in 1860, and continued with the Company until his death.

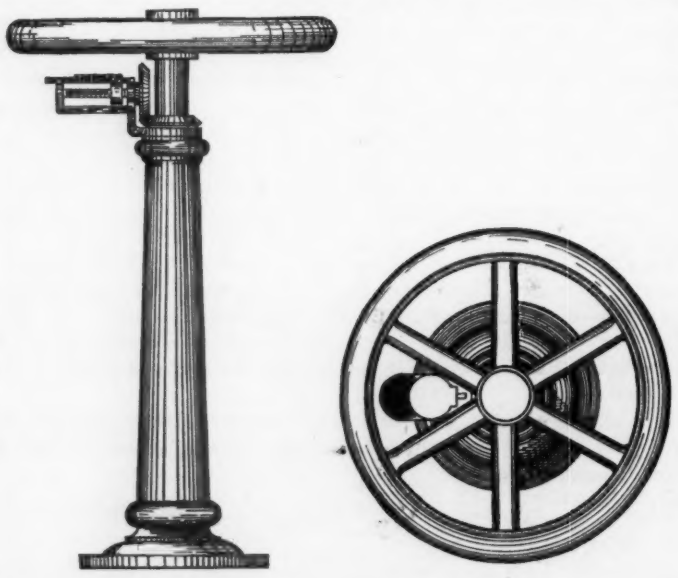
Mr. Cushing's lifework as a gas engineer was marked by success; and in all the various relations which he sustained to the business of gas manufacture, whether as a member of the several Associations, or as an officer, his course was always marked by a quiet dignity of manner, coupled with good practical judgment, which made him an agreeable associate and a wise and prudent counsellor.

In his death we feel that this Association has lost one of its most valued and worthy members, and that his memory will always be cherished by the most kindly feelings of all his associates.

(Signed) SAMUEL G. STINESS, A. B. SLATER, C. F. PRICHARD, } Committee.

The Meyer Valve Indicator.

This apparatus, herewith illustrated (which is covered by United States Letters Patent, granted October 8, 1889), is known to the trade as the Meyer valve indicator, and its claim for consideration at the hands of gas engineers—that is, in respect to its especial advantage for their use—is that it indicates clearly, from a simple glance, the exact state of the valve opening. In short, it presents a picture of the interior of the valve in the position most convenient to the eye of the person operating the valve. It can be applied to any valve—gas, steam or water—in any position howsoever hidden, and does not get out of order. Many of



these indicators have been used for some time in this city and elsewhere, on valves from 12 inches to 30 inches diameter. For application in a valve room it is only necessary to know the size of the valve, the number of turns required to raise it completely, the diameter of the valve stem, and the distance from the top of the valve stem to the upper side of the flooring in the valve room.

Any additional information in respect to the Meyer apparatus may be readily obtained from Messrs. James R. Floyd & Sons, of this city, who are the sole manufacturers of the device.

The Manufacture of Oxygen for Industrial Use.

The London *Journal* reports that at a recent meeting of the Institution of Mechanical Engineers, in London, a paper on the above subject was contributed by Mr. Kenneth S. Murray. It described (with the aid of illustrations) the plant used by Brin's Oxygen Company, with which the author is connected, whose works in the Horseferry Road the members were afforded an opportunity of visiting. In view of the recent utilization of oxygen, manufactured by the Company's system, for the purification of gas at the Ramsgate Corporation Gas Works, on Mr. W. A. Valon's recommendation, and under his supervision, an abstract of the paper, and a short report of some of the remarks thereon, may be of interest.

The author commenced by referring to the discovery made by the eminent French chemist Boussingault, about 30 years ago, upon which the Brin process is founded—that monoxide of barium has the property of absorbing oxygen from the atmosphere when heated to 1,000° Fahr. (the result being a dioxide), and that the oxygen thus absorbed would be given off again at a temperature of about 1,700° Fahr.; the monoxide being apparently restored to its original condition. It was found, however, that the barium monoxide gradually lost its virtues as an agent for extracting and giving up again the oxygen in the atmosphere. The discovery consequently had no important industrial result for very many years, until the brothers Brin determined to turn the researches of their compatriot to commercial uses. The barium oxide, commercially known as baryta, is used in bleaching processes, and is therefore an article of commerce; but that which is placed on the market by manufacturers is not sufficiently pure for the purpose of oxygen manufacture. The baryta required was therefore made on the Brin Company's works; and its manufacture has been so far perfected that the difficulties encountered by Boussingault and others have been practically overcome.

The method of working is as follows: The baryta is placed in vertical steel retorts, and these are subjected to the heat generated by the burning of carbonic oxide from a gas producer, which forms part of the apparatus. The retorts are 9 ft. long and 7 in. in diameter; the metal being ½ in. thick. In the plant described there are 24 retorts, which will hold 2,100 lbs. of baryta. Arrangements are made for

charging or emptying the retorts while in position. This is one of the recent improvements in the plant. Air is compressed in a suitable pump to a pressure of about 10 lbs. to the square inch, and is then delivered to the purifiers containing caustic lime and caustic soda, in order that the carbonic acid and moisture may be extracted. After leaving the purifiers, the air passes to the retorts, and the oxygen is absorbed by the baryta; the nitrogen escaping into the air through a release valve. When the peroxidation of the baryta has continued for the desired period (say, 7½ minutes), the operation of the air pump is reversed by an ingenious automatic device which throws the purifiers out of the circuit by means of cocks, and the retorts are subjected to a vacuum of about 26 inches of mercury. Deoxidation of the baryta then takes place, and the gas thus obtained is stored in a suitable receptacle. The result is oxygen to the extent of about 96 per cent.

The cost of production, allowing for depreciation of retorts and baryta, is said to range from 2s. per 1,000 cubic feet in ordinary gas works, to 6s. 6d. in works especially erected for the production of oxygen only, where additional charges would have to be made for labor and rent. The demand for oxygen in retail business appears to be constantly increasing. In 1887, Brin's Oxygen Company sold from their works no more than 142,000 cubic feet for limelight and other purposes. The quantity sold in 1889 amounted to just 1,000,000 cubic feet, notwithstanding that the Manchester Oxygen Company have recently taken over the whole trade of the North of England.

The paper closed with a description of the high pressure cylinders in which the oxygen is sent out, and of the compressors used for charging them; and in connection with the industrial uses of oxygen, the author referred the members to the paper read by Mr. Valon before the Gas Institute in June last year.

In the course of the discussion on the paper, Dr. Thorne, the Company's Chemist, gave some additional information. He explained that the opinion which had been expressed as to the dependence of the process for its extensive application upon the successful manufacture of the steel storing cylinders, was incorrect; for the cylinders were only used in storing small quantities for such purposes as limelights, etc. Wherever the use of the oxygen was at all extensive, the gas works or steel works at which it was employed would have plant erected expressly for its manufacture, and then no compressive storing would be required. The introduction of oxygen into metallurgical processes had a great future before it, and at the present time a number of very important experiments were being carried on with regard more especially to the reduction of the refractory ores. It had been stated that difference of pressure was the key to the success of the process; but he reminded the members that there was nothing extraordinary in the fact that at different pressures different chemical operations took place. When the plant was first erected, the peroxidation was conducted at a dull red heat and the deoxidation at a bright red heat, both at the same atmospheric pressure. It was afterwards found that the same effects could be obtained, but far more economically, if the temperature at which the two operations were conducted was kept constant at a little below the mean of the two, and if the pressure was increased for the first operation and decreased for the second. Theoretically, 1 lb. of baryta would absorb and give off again 1¼ cubic feet of oxygen. With the old process, only about 0.6 or 0.7 cubic feet could be obtained practically; and even this occupied three hours. With the new process, although the same yield of oxygen was obtained, the cycle of operations only took 15 minutes; so that the new process was in the end much more economical. With regard to the industrial uses of oxygen, the purification of coal gas was a prominent feature among them. It was being tried at the Ramsgate Gas Works; and it was hoped that Mr. Valon, the Engineer of those works, would have been able to attend the meeting to speak on the subject. But he was unfortunately prevented from doing so on account of an attack of influenza which had confined him to his room. Dr. Thorne then described the plant in use at Ramsgate and explained the process of purification by oxide of iron. He stated that in carrying this out, a small quantity of air was sometimes mixed with the gas before it entered the purifiers, so as to make the process continuous so long as the oxide retained its purifying property. This, however, had the effect of detracting somewhat from the illuminating property of the gas, due to the nitrogen in the air admitted to revivify the oxide. It was found that by using a corresponding quantity of pure oxygen in place of air, not only was the revivification more effectually carried on, but that the loss of luminosity resulting from the mixture of air, gave place to a slight increase of lighting power. A further discovery was made that the oxygen could be employed with the lime process of purification, and the use of oxide done away with; for, if oxygen were employed in the same way, the sulphur compounds could be removed by the lime process, and render auxiliary oxide purifiers unnecessary. Mr. Valon had stated that the total sulphur in purified gas treated in this way did not exceed 8 grains per 100 cubic feet. The quantity of oxygen passing over into the gas must be small, and then the illuminating power was increased; but if any considerable excess of oxygen passed, the lighting power was decreased. The proportion of oxygen found to give the best results had been stated by Mr. Valon to be 0.10 per cent. of the volume of the gas for every 100 grains of sulphur per 100 cubic feet of crude gas. Under these conditions, the sulphur remained fixed in the lime (partly as free sulphur), and did not move forward when the lime became saturated with carbonic acid, as was the case under ordinary conditions. The life of the lime was thus nearly doubled. A most important feature, so far as the public were concerned, was that the lime, when at last it became spent, was an almost odorless and dry substance. The advantage of this in a pleasure or health resort such as Ramsgate was, as Mr. Valon pointed out, very great. Having referred to some of the other commercial uses of oxygen, Dr. Thorne concluded by remarking that the industry was at present in its infancy; but he believed that in the future these uses would be found to multiply almost indefinitely. Sir James Douglass said he was more especially interested in the production of oxygen with the view to its application to the intensifying of light. Experiments had been made at the suggestion of Mr. Goldsworthy Gurney, who had offered to make a trial at Oxford Ness light. With the same sectional area, the intensity of the light had been increased 2½ times. This was very satisfactory; but the application was not successful commercially, as the oxygen was too dear, and it was found better to pay for more oil than the oxygen. In replying at the close of the discussion, Mr. Murray stated that the price of oxygen was 2s. per 1,000 cubic feet when made and used at one place—for instance, in the case of a gas works, where special plant was erected and the oxygen used as it was made. Compressing the gas doubled the price; but in any case the figures varied with the conditions under which the oxygen was made.

Fire Danger from Outside Electric Currents.

The Boston Manufacturers' Mutual Fire Insurance Company have published the following circular:

Electric light was first introduced in a very few risks insured by this Company before the year 1881; in that year, and in the first six months of 1882, in was adopted in a very considerable measure. In this period of its early introduction, prior to April 1, 1882, we received notice of 23 fires which had been set by the electric current in only 61 mills which had then been equipped. No claim for loss was made on any of these fires, but they disclosed conditions which were very alarming to us. An immediate investigation was made, under the direction of Mr. C. J. H. Woodbury, and certain rules were adopted for putting up the apparatus, insulating the wires, and guarding against the dangers disclosed in these 23 fires. These rules were immediately submitted to all the electric light companies or manufacturers of electric lighting apparatus who had any standing in the community, and were at once adopted by them, as well as by all insurance companies. They have not been changed since that date except so far as new inventions have called for modifications.

Since April 1, 1882—a period of nearly eight years—we have received no notice of any fire which could be attributed to electricity in any risk insured by this Company, and of course no claim has been made upon us for a loss which could be attributed to this cause. Our experience, therefore, justifies the conclusion to which we came after the first two years of electric lighting—that under proper safeguards it is the safest method of lighting that can be introduced. Electricity has also been applied in some of the works insured by us as a motive power, and electricity is now applied to lighting or motive power in over 600 risks which are insured by the factory mutual companies.

Attention, however, has lately been called to the danger of wild currents of electricity generated on the wires which may be in use for lighting, for power, and for railway service in many cities. There appears to be very little doubt that the recent destructive fire in Boston originated in the diversion of a high-tension current of electricity from its own wire to an electric-clock wire, on which it was carried to the building in which the fire originated. There appears to be little doubt that this conflagration may be attributed to the lack of precaution in guarding against an outside current of electricity. Such currents may be carried from their proper wires to other points in all cities and towns in which electric light or power is widely distributed on the public streets or over private buildings.

In order to guard against this hazard, the owners and managers of mills and works insured are advised to establish the following rules for the protection of their premises. These rules, after having been drawn by us, have been submitted to experts in various branches of electric science who are of the highest authority. The forms have been modified by them, again considered on our own part, and are believed to be suitable for what may be called an emergency:

1. No foreign wires of any kind shall be attached to buildings insured by this company for the purpose of carrying electric currents across the yard to any point.

2. All electric wires which may be required by the insured shall enter the premises at one point near the headquarters of the night watchman, where they can be kept under supervision; each of the said wires shall be guarded by a protector against strong currents operating by opening the circuit, and by a lightning arrester.

3. Such protectors against strong currents shall be located in a dry, accessible place inside the building, and as near the point of entrance of wire as possible, and shall be without ground connection; such protectors shall be mounted on non-combustible and insulated supports, which shall be provided with a receptacle for the burning or melted parts of such apparatus.

4. The lightning arresters on all wires must be placed between the protector against strong currents and the electrical portion of the apparatus within the building to which such wires are connected. No ground wires for such lightning arrester shall be attached to gas pipes within the premises of the insured.

5. All electric wires which may enter the premises of the insured must be insulated, between the line wire on the insulator attached to the buildings outside and the protecting device within, with the best quality of waterproof insulation. Moreover, such wires must enter at a distance of not less than three (3) inches from any other wire or any conducting material.

6. If any wires carrying high tension or strong currents are to be carried over or under other wires on the property of the insured, they shall be attached to poles so near to each other, with one wire so far above the other, that if a break should occur the pendant wire between these poles may not be long enough to come in contact with the wire below; or, if not carried on poles, these wires shall be so placed or protected with guard wires as to render a contact between different wires impossible.

7. If the high and low tension systems are in use in the same yard, even when developed within the works, the wires must be kept separate, and so wide apart that no contact or cross arc can be made.

Thoughts on Electric Units.

A writer in *Electrical Industries* says that in mechanical work we use quite a variety of units for measurement, and these units are quite well understood by most intelligent mechanics. Electrical measurements are mechanical, and the units adopted are directly related to the mechanical units with which we are familiar. The variations are in sizes of the units and their names. The reasons for adopting new units for electric work are similar to those which induces us to measure coal by the ton, butter by the pound, gold by the pennyweight, diamonds by the carat. We understand that the carat is a certain small part of a ton, but we do not care enough about this relationship to learn what part of a ton a carat is. The human eye has a better idea of the "fitness of things" than to measure diamonds by the same units we do coal. Therefore when scientific men were called upon to establish units for electric measurements, they sought such sizes as the force demanded, and then worked to establish accurately some standards to represent the units adopted. As these units were new they required new names, and what better course could have been adopted than to apply the names of those men who had taught the world so much of electricity as to make a need for these new units of measurement?

An electrician knows that his units are certain small parts of the common mechanical units, but he doesn't think of this relationship, except in those calculations, involving horse power parlance, any more than the diamond dealer thinks of the relation between the carat and the ton. The units mostly in use are the ohm, the volt and the ampere.

We know that any conductor offers resistance to the passage of electricity, just as we know that pipes offer resistance to the passage of water, and a unit was established for measuring this resistance. It was called an ohm, in honor of the German mathematician who originated the simple formula so much used by electricians.

A unit was established to measure the force which "pushes" electricity through conductors. It is called a volt in honor of Volta, the great Italian electrician. We have two units for expressing the force which pushes water forward, used according to circumstances. If the water is flowing through pipe systems like city water works we use the "pound" to measure the pressure, but if flowing down streams, as used for water power, we use the "foot of head" as the unit.

A unit of quantity was also established, and was called an ampere in honor of a French electrician. There are many other units in use by electricians, but the three mentioned are those most in use, and a full understanding of these is of vast importance to the mechanic. When the uses of these units are well understood it then becomes easy to appreciate the others that have been adopted, but are much less frequently used.

These three units are directly related to one another. The ampere, for instance, is the quantity of electricity which would be forced through a conductor which had a resistance of one ohm by an electric pressure of one volt. To know the work to be done by an electric current we must know both the force and the quantity, which is the same as we require in water power calculations. To say, for instance, that 1,000,000 gallons of water pass a certain place in one day would not convey any idea of the power to be obtained therefrom. The hydraulic engineer must know the number of feet fall that he could obtain for this water. Tell this engineer that you have 1,000,000 gallons per day with a drop of 20 feet, and he could very soon tell you the horse power it would give. So also with electricity; to say that we have 10 amperes would give the electrician no idea of the work that could be done by the current. He must know the force behind it. If, however, you say that you have 19 amperes and a force of 100 volts, he could very soon calculate the amount of horse power obtainable, and he could also tell what could be accomplished with this current in the various ways in which it is used.

The ampere is in reality the measurement of the rate of flow, so to speak, of the electric current, and it does not really give an idea of the quantity passing, because for this we need also to specify the time. Perhaps the best comparison is that of a trotting horse. To say that a horse passes us at a 2:40 pace would give us no idea how far he travels, but to say that he travels at a 2:40 pace for 2 minutes and 40 seconds would give us the idea that he had traveled just one mile. Using the second as a unit of time, then if we have one ampere for 1 second we have in reality a unit of quantity, and electricians have called this coulomb. This term has not come into general use, however, and another unit of quantity has been adopted in practical work. In this case the hour is used for the unit of time, and to express this unit we simply connect the two terms by a hyphen, viz., ampere-hour, and this is the unit used for most electric meters. Unfortunately this unit conveys no idea of the work that can be done by the current. For instance, one ampere hour of electricity with pressure of 50 volts, would only be worth one-half as much as one ampere-hour with 100 volts, and if an electric light company furnishing electricity with a pressure of 50 volts should charge the same price per ampere-hour as another company supplying electricity at 100 volts, the former would be receiving twice the rental of the latter. This difficulty has given rise to the practice of registering the work in lamp hours when used for lighting, and the most satisfactory meters to the public are those which indicate the work in this way. In these cases the 16 candle power lamp is used for the standard.

There are two methods of distributing electricity in practical work, one in which the current is kept constant and the force is varied according to the amount of work to be done; the other in which the force is kept constant and the quantity is varied in proportion to the work done. Suppose we had at the top of a hill a supply of water which we wish to use for power, and suppose that on one side of this hill we could descend into a valley in the depth of 100 feet, and on the other side we could only descend 10 feet, and suppose, furthermore, that we wished to operate 10 water wheels from this water power. If we put these 10 wheels side by side and connect them by a pipe large enough to supply them all, the pressure of the water would remain constant and the quantity flowing would depend upon the number of water wheels working; or, in other words, upon the amount of work done. On the other hand, supposing we put these wheels on the other side of the hill, one wheel below the other, 10 feet apart, and connect them with a pipe one after the other. To make this comparison complete it must be considered that each wheel is on a shelf or terrace in so far as the pipe is not in a straight line up and down the hill, and because each wheel is supposed to require a head of 10 feet only. Now, in this case the quantity of water passing remains constant, whereas the pressure or total drop can be considered as practically proportional to the number of wheels working. To operate all 10 wheels on this system requires a total fall of 100 feet,

and the same water works all the wheels; whereas, to work the 10 wheels by the other system requires a fall of only 10 feet, but each wheel takes its own separate supply of water. Although this comparison is a little difficult, it is essentially the same as the two methods of distributing power by electricity. If, for instance, we have 10 lamps, each of which requires a current of 10 amperes in quantity with a pressure of 10 volts, and we connect these lamps one after the other, then the same current of 10 amperes would work all the lamps, but the force would be 10 times 10 volts, or 100 volts, whereas if we connect these lamps side by side, then each would require its own supply of electricity, the same pressure would work them all, but it would require 10 times as much electricity to supply them.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

A CORRESPONDENT at Freeport, Ills., writes: "Those who suppose that Freeport is sleeping are very much mistaken, in fact Freeport is wideawake. Especially so is this the case in the instance of our Freeport Gas Light and Coke Company, whose proprietor (Mr. Farwell) has decided to install a water gas plant, probably with a view to hastening the time for the distribution here of a fuel gas. A new gasholder will be put up this spring. A day or so ago Supt. Runner informed me that the Company had rented the corner storeroom in the building of the Y. M. C. A., which is to be fitted up as an office and show room. Mr. Farwell, aided by Supt. Runner, will here keep an assortment of burners, globes and electric light fixtures, and last—and most important of all—a good collection of cooking and heating stoves. Mr. Farwell is determined that the housekeepers of Freeport are to have ample opportunity for becoming conversant with the value of *illuminating gas* as a fuel for domestic purposes, and it may be taken for granted that he will popularize its use in this direction by selling it at a low figure.—T. T."

THE Augusta (Me.) Electric Light Company has reduced the rate for each 16-candle power incandescent light supplied to 75 cents per month. The former price was 93 cents.

AT a recent meeting of the Frostburg (Md.) Gas Light Company, Messrs. B. Stone, Lloyd-Lowndes, A. E. Hitchais, F. C. Beal and Jas. Keene were appointed to make the necessary arrangements for the erection of an electric light plant to be operated in connection with the gas plant. We understand that provision will be made for an incandescent plant equal to the requirements of 750 lamps of 16-candle power each, and that the capacity of the arc system will be rated to 50 lamps of 2,000-candle power.

WE understand that the proprietors of the Stoughton (Mass.) Light, Heat and Power Company have decided to make a 12½ per cent. reduction in gas rates.

THE electric light plant at Huntingdon, Pa., which is operated as an adjunct to the local gas works, was put in service about a fortnight ago. A correspondent at Tyrone, Pa., sends us the following particulars concerning it: "The building containing the plant is a one-story brick structure located at the corner of Second and Allegheny streets, nearly opposite the Pennsylvania Railroad depot, and adjoins the gas works. The boiler room, which is at the eastern end of the house, contains two boilers, each of 70-horse power capacity. The dynamos are located in the western end of the house, are two in number, and are operated by the improved Ball engines (two in number) of 80-horse and 60-horse power, respectively. The former will operate the dynamos for supplying commercial incandescent lights, while the other will drive the machine that is to furnish the arc current for lighting the streets. The Thomson-Houston system was chosen. The plant cost about $25,000, and is complete in every detail of modern practice. Mr. B. F. Africa is Superintendent, and Mr. Chas. E. Bates will have charge of the works. Both are competent young men.—C. H. D."

THE appointment of Mr. Samuel J. Fowler, of Westfield, Mass., to the Superintendency of the Springfield (Mass.) Gas Company has been followed by the naming of Mr. William T. Thayer to the position of Superintendent of the Westfield Gas and Electric Light Company. We understand, however, that Mr. Fowler will continue to act as Treasurer and General Manager of the last named corporation.

THE Selectmen of New Brunswick, Me., have been authorized to enter into a contract with the New Brunswick Gas Light Company for the lighting by gas of the public buildings of the town, and also such streets as are not lighted by electricity.

THE new holder on the 26th Ward works of the Philadelphia municipal gas plant was formally inspected by Councils and Gen. Wagner on the 21st inst.

A DIVIDEND of 1 per cent. on the capital stock of the Chicago Gas Trust Company has been declared. It is made payable on and after next Friday. The transfer books remain closed from March 15th to April 25th. The annual meeting of the Trust will be held on the 24th prox., and one of the important matters to be considered thereat will be a proposition to change the name of the corporation. This means, of course, that mea ures have been taken to re adjust the affairs of the Trust.

IN the meantime, we might add that the Trust has given notice that it will, until further notice, through separate meters, furnish a supply of gas for fuel purposes, in quantities desired, at the rate of $1.25 per 1,000 cubic feet, with 25 cents per 1,000 off for prompt payment.

THE buildings of the electric lighting annex of the Faribault (Minn.) Gas and Electric Light Company were destroyed by fire on the evening of the 13th inst. The total loss was $9,075, apportioned as follows: Buildings, $1,800; apparatus, $7,275. The rather astonishing cause given for the conflagration is that a pile of wood which was placed *too close to the furnaces* took fire. Wood under those circumstances can usually be counted on to do its duty. But where was the engineer?

MR. ROBERT F. FITZ, who can travel incog. with ease, grace and dignity, has been appointed Superintendent of the Elgin (American) Gas Company, of Illinois. Mr. H. S. Whipple, formerly Superintendent at Elgin, goes to Rockford (Ills.) to take charge as agent there of the American Company's latest purchase. We congratulate Messrs. Whipple and Fitz on their promotions, and the American Company also on its good fortune in having such attaches.

A CORRESPONDENT, writing from San Francisco, Cal., under date of March 11th, forwards the following: "The City Council, on March 5th, granted to George W. King, of Los Angeles, Cal.—the right has been properly signed by the Mayor, and is therefore binding—and his assigns and legal representatives, the right to lay gas mains in that city. The conditions are: The life of the right is 50 years, the Company is not to charge over $1.50 per 1,000 cubic feet to the city buildings (to include schools, engine and police stations, etc.), nor is any higher rate to be charged to private consumers. King is to file a bond, in $20,000, for the proper replacing of the street pavements, is to lay 10 miles of pipe (distributing mains) within 1 year, and is to pay 2 per cent. of *the gross receipts* each year to the city, the payments to be made at the end of each 6 months. I have but one copy of the ordinance, else I would send you the thing complete. Mr. King was connected in some manner with the gas companies of your city, and claims to have been one of the first to introduce water gas there. He is in control of capital, and I believe he means business. I will send on word if there is anything new in the developments. The price of gas was reduced in Los Angeles, on March 1st, from $2.25 to $2 per 1,000; but the people seem to have been spoiled there because of the late gas war in that city, when gas sold for a time at as low as $1 per 1,000.—RETORT."

THE following, respecting the fuel gas supply of the Louisville (Ky.) Gas Company, will be read with interest: The mains and plant of the absorbed Citizens Gas Company are employed on the work, and the streets on which the fuel gas supply may be obtained are the following: 7th, from Ormsby avenue to Chestnut; 6th, from Broadway to Main; 4th, from Broadway to Main; 2d, from Broadway to Main; Broadway, south side, from 4th to 7th; Broadway, north side, from 2d to 6th; Chestnut, from Brook to 10th; Walnut, from 3d to 6th; Jefferson, from 1st to 7th; Market, from Jackson to 12th; Main, south side, from 1st to 14th; Madison from Brook to Preston; Preston, from Madison to Market; 12th, from Main to Chestnut. The price to consumers on these streets will be 50 cents per 1,000 cubic feet, and the Company has also reduced the price of gas (of the illuminating sort) to parties not in the fuel gas district proper for purposes other than illumination to 75 cents per 1,000 cubic feet—a separate meter to be used. Therefore does it seem that Engineer Barret is to be credited with being the first in this country to have practically shown the way to the realization of the full benefit of a fuel gas that is bound to succeed—that is, the supply of a rich gas at a reasonable figure—indeed, at a low figure; for his illuminating fuel gas at 75 cents per 1,000 is bound to be a cheaper and better article than the non-carbureted fuel gas at 50 cents per 1,000. President Morris says that the Company will be able to furnish all the fuel gas needed, but will not make any extension of the fuel

gas mains until the demand justified it. The Gas Company has fuel gas in the district of the Kentucky Rock Gas Company, but does not now expect any consumers in such district, as the price of natural gas, with the discount off, is but 22½ cents per 1,000 cubic feet, while the artificial article is to be charged for at the rate of 45 cents per 1,000 with the discount off.

WE understand that Mr. Walter Woolcott, the urbane and clever Secretary of the Kansas City (Mo.) Gas Light and Coke Company, is now in the East, with a view to inspecting the various processes under which fuel gas is manufactured. He will visit the following places: Chicago, Ills., Jackson (Mich.), Cleveland, Akron, Pittsburgh, Pa., Jersey City, Louisville, Ky., and Tacony, Pa.

THE bill filed by F. M. Charlton against the Chicago Gas Trust Company to wind up its affairs and for the appointment of a Receiver was dismissed before Judge Collins, and a new petition or suit was filed. The new proceedings state that the Trust is about to pay to its stockholders the sum of $250,000 in dividends, and complainant avers that if the Trust erected gas works, as the Supreme Court says it should, it could not pay the dividend just declared. In addition to the prayer in the first complaint Mr. Charlton asked that the payment of the dividend be enjoined.

AMONG new incorporations we note that of the Leavenworth (Kas.) Electric Light Company. The purpose of the organization is to supply light and heat by the use of gas, electricity, steam or hot air. The capital is put at $100,000, and the Directors are: Messrs. Edward Carroll, McCown Hunt, Paul E. Harms, John Gimper and E. Henning.

MR. J. F. SCRIVER, Secretary of the Montreal (Can.) Gas Company, recently had a novel experience, as may be gleaned form the following bit of history. Edward Holloway, of 210 Peel street, had the worthy Secretary up in a local police court on a charge of assault. The alleged assault took place in the office of the Gas Company, to which premises Holloway had repaired for the purpose of asking for further grace in the matter of the payment of an overdue gas bill. In the course of the negotiations some exciting language was indulged in, and at last Mr. Scriver ordered Holloway to leave the room. On the refusal of the latter to obey the order, Mr. Scriver ejected him. The action for assault followed, but on hearing the evidence the Judge dismissed the suit with costs, holding that plaintiff should have left the premises when requested to do so.

ONE or the best arranged and most capably managed electric light plants within the borders of the State of Georgia is that owned by the Athens Gas and Electric Light Company; and it ought to be a good one, for $50,000 was expended in its construction and equipment. It might also be said that the gas works are modern and complete. The electric annex contains two steel boilers of 70 horse power each, and two engines (one of 70-horse and one of 50 horse), which operate one 50-light arc machine, and one 650 light incandescent dynamo. The apparatus was furnished by the Thomson-Houston Company, and it is handsome and complete. Forty arcs are now in circuit, and the Company has application for 300 incandescent lamps, which it is now arranging to supply. Dr. J. A. Hunnicut, President of the Company, has great faith in its future.

THE Board of Public Works, Duluth, Minn., have extended the contract for public lighting, for a period of 3 years, with the Duluth Gas and Water Company.

WHEELING, West Va., is very much excited over charges brought against Oscar Seeley, Trustee of the City Gas Works, that three years ago he appropriated over $1,000 worth of materials to his own use. Ex-superintendent Darrah is said to have made the accusation.

SOME time ago we noted that the gas works at Reading, Pa., operated by the Reading Railroad Company, had been seriously damaged by an explosion. The Company, as a result of this happening, has decided not to rebuild the works, and to abandon the use of gas altogether. In the meantime the electric plant will be enlarged sufficiently to furnish all the light needed in depots, yards and shops.

THE lighting situation at Los Angles, Cal., has been further simplified in the purchase by the Los Angeles Lighting Company (which is a consolidation of the Los Angeles Gas Company and the Lowe Gas and Electric Company) of the Los Angeles Electric Light Company. President Cline, of the Gas Company, has been chosen President of the newly-acquired corporation.

THE Methuen (Mass.) Gas Light Company has been incorporated with a capital of $25,000. Its officers are: President, James F. Wall; Treasurer, Granville Parks. The stated objects are: "The manufacture and sale of illuminating and fuel gas and electricity for light, heat and power." It is presumed that this Company means business; for it will be remembered that a similar venture proposed there some time ago was never brought off.

THE officers of the Troy (N. Y.) Gas Company say that the public may rest assured that the Company will be ready to fulfil its contract with the city within the time specified—90 days from the date of contract—for the public lighting by electricity.

IN the matter of the failure of the Artificial Gas Company, of Greenville, Darke county, O., briefly alluded to in our last issue, we have the following further advices, by way of Dayton, Ohio: "One of the worst failures ever reported in Darke county is that which occurred about a fortnight ago in Greenville. The Artificial Gas Company, with its President and Secretary (John and Elijah Devor) are heavily involved. The matter was brought to a head by the filing of a suit by Mr. R. R. Dickey, of this city, who is well known to the fraternity of the West from his connection with the Dayton Company, who asked that the Greenville Artificial Gas Company be declared insolvent, and that a receiver for its affairs be appointed. Shortly thereafter John Devor made a voluntary assignment, and this act was duplicated immediately by Elijah Devor, both acting as individuals, the assignees being James A. Reis and Frank M. Eidson, respectively. These acts were followed later by the assignment of the Devor Gas Company as a corporation, Reis and Eidson being again named as assignees. The liabilities of the Company are put at $50,000, and the assets are considerably under this figure. The liabilities include $14,000 bonded indebtedness, and this sum is divided in the following manner: R. R. Dickey, of Dayton, $4,000; Citizens National Bank, of Urbana, $4,000; Second National, of Greenville, $6,000. The bonds, however, are amply secured. The personal liabilities of the Devors are estimated at $56,000, with perhaps assets of $30,000."

IN our last we made note of an application to the authorities of Salt Lake City, by one Judge French, for an opposition charter. The Judge has thus unbosomed himself in respect to the project: "I have all the capital behind me necessary to carry out the plan and make it a success. I am somewhat familiar with the gas business now, being interested in two Eastern companies. This city needs first class gas works, such as we shall build if we are given the franchise, and I know it would be a good investment." Yes, Judge, it would, and it would further give you an excellent opportunity to harras the existing gas company, and perhaps to give you a chance at its treasury. Come to think of it, we were always under the impression that Salt Lake City had a pretty good gas works, and that its business was handled in a liberal and progressive fashion. In fact, we are still under that impression. Further, the Judge's plan may yet "gang aft," and we certainly hope they shall.

THE Woonsocket (R. I.) Gas Company is installing a new station meter.

THE Allegheny Heating Company, of Allegheny, Pa., has been awarded the contract for supplying natural gas to the public buildings in that city. The rate agreed on is $25,000 per annum.

THE rates on cast iron pipe are not likely to be advanced this season, judging from the tenders made by several manufacturers in the competition for supplying pipe under contract to the Water Committee of Allegheny City. The successful bidders made the following propositions: 4-inch pipe, $26.40 per ton; 6-inch, $24.80; 8-inch, $24.80; branches, 2¼ cents per pound; sleeves, 2¼ cents per pound.

MR. WILLIAM ST. JOHN, General Agent of the gas department of the Safety Car Heating and Lighting Company, of New York, who are the proprietors for the Pintsch compressed system of gas lighting for the States, has about convinced the Georgia Southern Railroad Company that the service of the Company would be improved were it to adopt the Pintsch system for the lighting of its cars. It is also rumored that the Pullman Company will light all its sleeping coaches by the same method.

CHARLES JENNEN, a resident of Clifton, Ohio, a village close to the city line of Cincinnati, has applied to the courts for an order setting aside the contract made by the village with the Cincinnati Gas Company for a supply of gas to the public lamps.

WE welcome to the East Mr. George C. Hicks, formerly of Chicago, Ills., who is to have personal supervision of the Boston Fire Brick Works, owned by Messrs. Fiske Coleman & Co., of 62 Congress street, that city.

THE Monroe (Mich.) Gas Light Company having completed its original term (30 years) of incorporation, has filed articles of association for another term of 30 years.

A RATHER odd suit, which is reported from Newark, N. J., is that of W. H. Ratcliffe and others, against Jennie A. Moorehouse and others. According to the papers in the case, the defendants have been attempting to invent a gas machine for the past 15 years, and some time ago they engaged a party to draw up plans for a new construction. When these were finished they awarded the construction of the machine to plaintiffs, who claim that defendants agreed to pay them at the rate of 50 cents an hour till the apparatus was completed. The latter assert that a fixed sum was agreed on. The difference is perhaps $200.

AT last the Trustees of Cicero, Ills., have granted a franchise for the construction and operation of a gas works for that town to Messrs. Martin Maloney and W. A. Toles. The prices for gas are not to exceed $1.40 per 1,000 cubic feet for illuminating gas and 60 cents for fuel gas, for a period of 2 years from the passage of the ordinance, and after that time, $1.25 and 50 cents respectively. The ordinance provides that in all streets that are to be permanently improved, mains and laterals shall be laid before the improvement, and all service pipes, connections and meters to be put in at the expense of the Company. The works are to be completed and gas is to be supplied by November next, failing to do which the Company forfeits $10,000 to the town, which sum will have to be deposited with the Town Treasurer before the ordinance is operative.

AT a special meeting of the Norfolk (Neb.) Council, Messrs. G. A. Brooks, of Bazile Mills, and certain Chicago capitalists, were granted a franchise for the construction and operation of a gas plant in Norfolk. The plant is to cost not less than $50,000, and is to have a daily capacity of 100,000 cubic feet. Work is to be commenced on the plant within 6 months, and it is to be completed within 18 months. This place is a post village of Madison county, Neb., and is on the north branch of the Elkhorn river, at a point about 50 miles north of Columbus.

ACCORDING to a local authority, "The Superintendent of the Alexandria (Va.) city gas works reports that an expenditure of some thousands of dollars will be necessary to put the plant in complete order, if not to secure its safety. The gas works has always been the money maker of the corporation, and now that the establishment is relieved from the burden of lighting the streets, which, in the works' report of 1890 was carried on at a cost of $6,116.79, it will pay into the city treasury about $10,000 per annum. Heretofore the policy has been pursued of allowing the gas works to run down for want of the stitch in time that saves nine, until lately. A very large expenditure was made on the works for a new holder, etc., and now new benches are required in order that the establishment may be put in thorough order. There will, however, still remain the probable expense anticipated by Mayor Downham in his last message, when he said that 'as the gas pipes were laid many years ago they must, in the nature of things, be nearly destroyed by rust.'"

LAST Monday the shareholders of the Beverly (Mass.) Gas Light Company adopted a proposition to increase the capital stock in the sum of $15,000, the money to be expended on plant betterment.

MANAGER LIVINGSTONE, of the St. Paul (Minn.) Gas Company, says that the proprietors will expend a large sum of money this year in extensions to the gas and electric divisions of their property. One item in the plans calls for the placing of about 16 miles of new gas mains.

RICHARD WELCH, Village Recorder of Litchfield, Minn., advertises for tenders for the construction of an electric lighting plant suitable to the needs of the district. Specifications can be examined at his office, and the competition will close at 7.30 P.M., of March 31st.

Hot Air Engine.

The principal features of the hot air engine invented, by Jerome H. Chase, of Buffalo, N. Y., are: It is provided with an ordinary and hot air chest in which is a slide valve of the usual form operated from the main shaft. Into the hot air chest leads a pipe provided with a valve and connecting with the upper end of a hot air reservoir, below which is a heater placed above a furnace, all these parts being inclosed in a case supporting the cylinder. The reservoir is provided with a number of parallel plates extending through the bottom on to the bottom of the heater. Into the heater opens a pipe leading upward and connecting by a discharge valve with one end of an air compressor arranged alongside the cylinder and operated from the crosshead of the main piston rod. On the other end of the air compressor is a discharge valve opening into a pipe leading into the ash pit of the furnace. In the heads of the air compressor cylinder are placed inlet valves connected by pipes with a closed reservoir located inside of a cooler placed on the outer end of the main cylinder. Water flows through the cooler to cool the air.

When a fire is started in the furnace the air in the hot air reservoir is rapidly heated. When the pressure in the reservoir is sufficient the valve is turned to allow the air to pass to the hot air chest and cylinder and operate the piston in a manner precisely similar to that in the ordinary steam engine. The exhaust may be discharged into the open air or into a room to be heated. Through one pipe the compressor discharges air into the furnace to aid combustion and through the other into the heater, from whence it passes to the hot air reservoir. The arrangement of the pipes and valves is such as to permit the operator to increase or diminish the supply of cold condensed air to either the heater or furnace. It will be observed that the air in this engine is first rapidly cooled, then compressed and forced into a heater, where it is subjected to the intense heat of the furnace. Another noticeable feature is the fact that the engine is double acting.

The Quality of London Gas.

The following is abstracted from Dr. Williamson's report on the quality of the gas supplied to London during the last quarter of 1889:

Illuminating Power.—The average illuminating power, in standard sperm candles, at each of the testing stations, was as follows:

The Gas Light and Coke Company.

Jewry street, E.C.	16.5
King street, E.C.	16.3
Dorset Buildings, E.C.	16.6
Ladbroke Road, W.	16.6
Devon's Road, E.	16.7
Carlyle Square, Chelsea, S.W.	16.1
Camden street, N.W.	16.3
Graham Road, E.	16.6
Kingsland Road, E.	16.4
Grove Gardens, Regent's Park, N. W.	16.5
Hornsey Road, N.	16.5
Lambeth Road, S. E.	16.3
Millbank street, S. W. (cannel gas)	20.8

Commercial Gas Company.

Parnell Road, E.	16.3
Wellclose Square, E.	16.1

South Metropolitan Gas Company.

Hill street, S. E.	16.3
Foster Place, S. W.	16.3
Stoney Lane, S. E.	16.2
Lewisham Road, S. E.	16.3
Burrage Road, S. E.	15.8
Blackfriars Road, S. E.	15.6

It will be seen from these results that the average illuminating power at the Blackfriars Road and Burrage Road stations of the South Metropolitan Gas Company was lower than the Parliamentary standard; and that it was above that standard at all the other testing stations. Several deficiencies in the illuminating power were reported during the past quarter—viz., at Jewry street, King street, Hornsey Road, Wellclose Square, Hill street, Stoney Lane, Lewisham Road, Blackfriars Road and Burrage Road.

Purity.—Sulphureted hydrogen was only once during the quarter reported to have been present in the gas—viz., at the Jewry street station of the Gas Light and Coke Company; and an appeal has been lodged by the Company against this return. The average amount of sulphur in other forms was considerably less than that allowed—viz., 22 grains—at all the stations, especially at Millbank street, Devon's Road, Parnell Road, and Lewisham Road, where it averaged less than half the quantity permitted. Ammonia has been present more or less frequently in the gas at all the stations, but only in slight quantities. There was no excess on any occasion during the quarter.

The Market for Gas Securities.

The city market for gas shares was in line with higher prices during the week, and Consolidated, on comparatively small transactions, moved up closely to 97, but reacted to 96¼. There can be no doubt about it but that when the market for money shows signs of a settled or normal condition that Consolidated will go to par and over. Other city shares are also inquired after, and purchasers are making all the concessions in respect to quotations. Brooklyn presents nothing of interest, unless it may be noted that Metropolitan is now at par, bid. The Appeal Tax Court of Baltimore has readjusted the tax rating of the Consolidated Company, of that city, and Secretary Smoot is to be congratulated on the finesse displayed by him in the premises. It is somewhat strange to us that the "ad. of Secretary," offering to sell a controlling interest in several California gas works does not receive more attention from investors in such properties. One of the works thus offered ought to be a rare good thing. Buffalo (N. Y.) shares are being sought after.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

March 24.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	96¼	—
Central	500,000	50	—	—
" Scrip	220,000	—	—	—
Equitable	4,000,000	100	117	120
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	116	118
Mutual	3,500,000	100	109	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	—	45
Preferred	5,000,000	100	84	87
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	109	111
Citizens	1,200,000	20	68	70
" S. F. Bonds	320,000	1000	102	103
Fulton Municipal	3,000,000	100	124	126
" Bonds	300,000		1[illegible]5	—
Peoples	1,000,000	10	80	82
" Bonds (5's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	100	—
Nassau	1,000,000	25	119	—
" Ctfs	700,000	1000	100	102
Williamsburgh	1,000,000	50	123	125
" Bonds	1,000,000	—	108	112
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	93	93½
2d " " "	3,000,000	1000	71	72
Bay State Gas Co.—				
Stock	5,000,000	50	24	25
Income Bonds	2,000,000	1000	—	—
Buffalo Mutual, N. Y.	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
" " Bonds	45,000	—	—	—
Chicago Gas Trust	25,000,000	100	43	—
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	1,650,000	1000	92½	93
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	102
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	99
2d "	2,500,000	1000	96	100
Consumers Gas Light Co., Jersey City	2,000,000	100	15	25
Bonds	600,000	1000	80	–
Cincinnati G. & C. Co.	6,000,000	100	201	203
Consumers Toronto	1,000,000	50	190	200
Central, S. F., Cal			80	90
Capital, Sacramento, Cal			58	

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Lids and Mouthpieces only in use over a year. Will be sold cheap. ISAAC C. BAXTER,
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Dip Pipes, Bridge Pipes, Stand Pipes.
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Four Purifiers, 10 by 16 ft., with 10-inch Connections and dry Center Seal.
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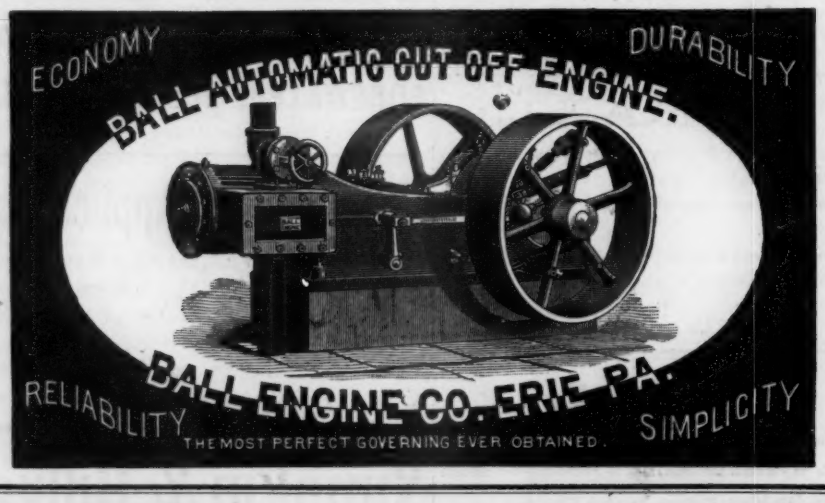

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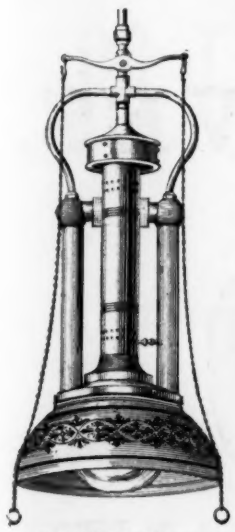

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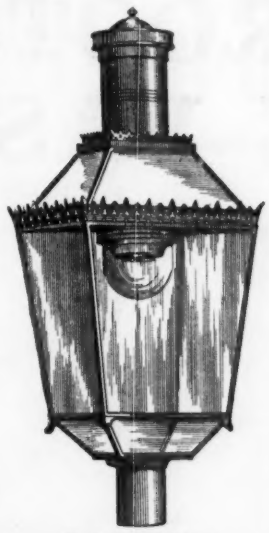

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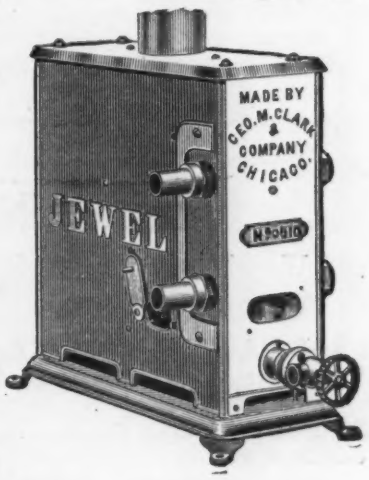

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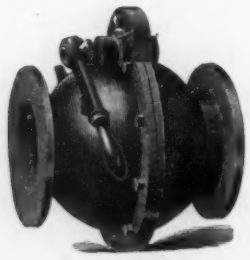

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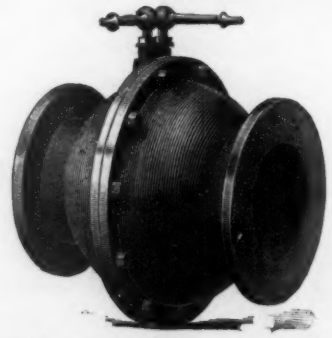

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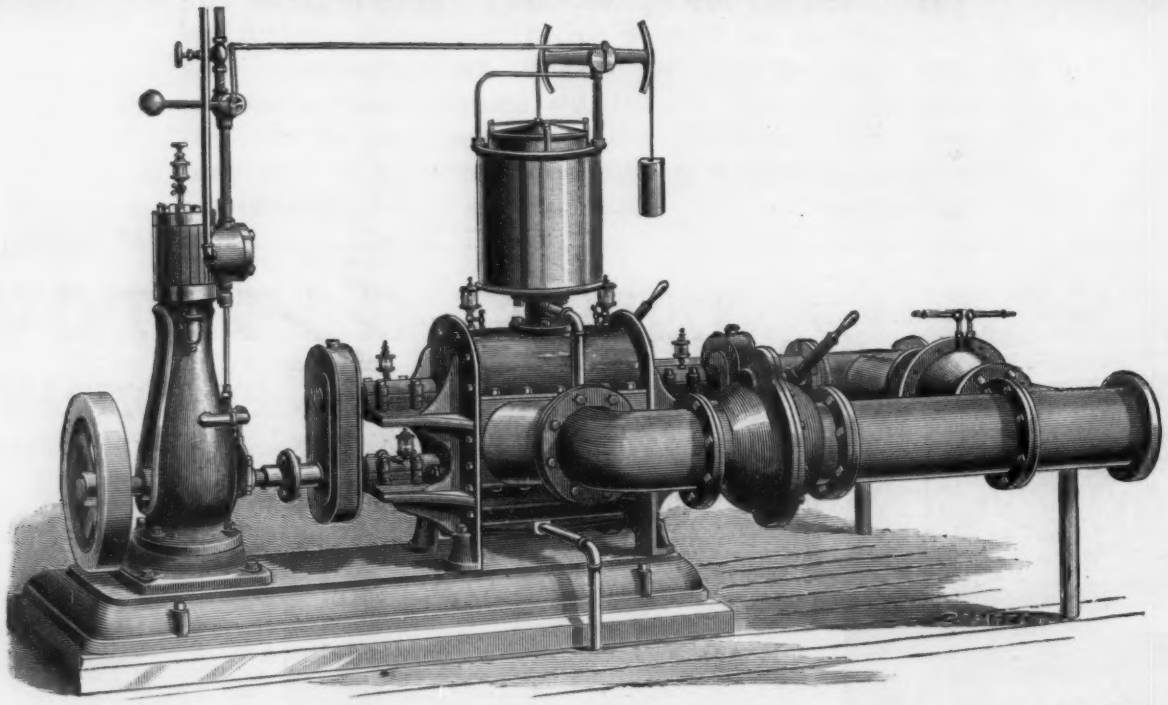

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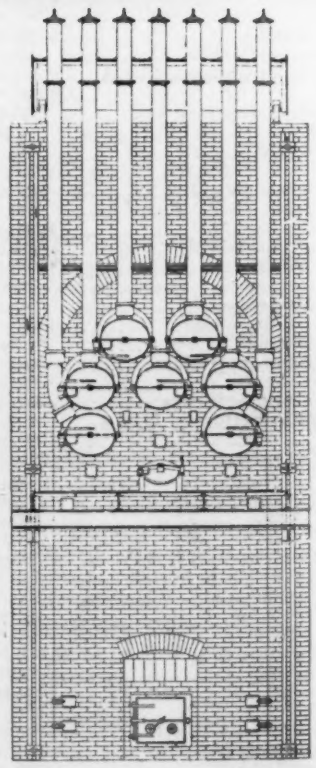

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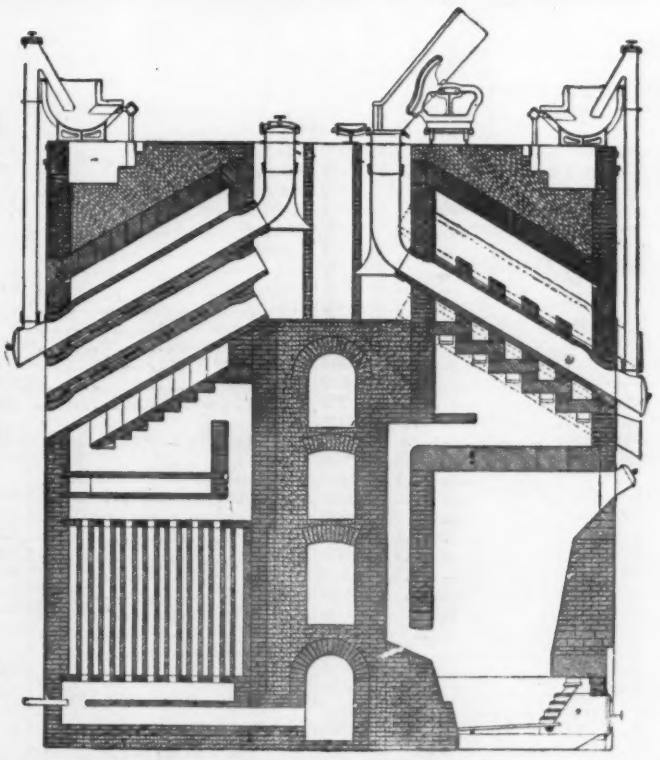

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Erected and in course of construction at present date:

	Capacity. Cubic feet per day.
Altrincham	600,0.0
Adelaide	600,000
Aldershot	200,000
Allegheny, U. S. A	1,000,000
Ashton-under-Lyne	1,250,000
Amsterdam	1,500,000
"	1,500,000
Annaberg	200,000
Arcachon	100,000
Animal Charcoal Co	200,000
Altoona, U.S.A.	350,000
Buxton	250,000
Bradford	1,000,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,000,000
"	1,000,000
"	3,000,000
Bremen	150,000
Baltimore, U.S.A.	1,000,000
"	1,000,000
"	1,000,000
Balmain, N.S.W	125,000
Bishops Stortford	150,000
Blackpool	400,000
Brussels	1,250,000
"	1,250,000
"	750,000
"	1,250,000
Banbury	250,000
Birmingham	5,000,000
Birkenhead	2,500,000
Blackburn	1,500,000
Bochum	600,000
Burntisland	250,000
Boston, U.S.A.	2,000,000
Brisbane	1,500,000
"	300,000
Burton-on-Trent	1,500,000
Barcelona	350,000
Barking	100,000
Baerlien & Co	20,000
"	20,000
Bombay	400,000
Buffalo, U.S.A., Mutual	750,000
" " **Citizen**	500,000
Brookline, U.S.A.	500,000
Bergen	350,000
Berlin	1,250,000
Bournemouth	1,000,000
Bridgeport, U.S.A.	500,000
Brunswick	300,000
Beck & Co., St. Louis	100,000
Barmen Rittershausen	600,000
Bexhill	125,000
Brooklyn, U.S.A	1,000,000
"	1,000,000
" **Nassau**	1,000,000
Brunner, Mond & Co.	400,000
Cheltenham	2,000,000
Cannes	200,000
Croydon	1,500,000
Copenhagen	200,000
Clevedon	200,000
Columbus, U.S.A	500,000
Cincinnati, "	1,500,000
" "	1,500,000
Chicago "	3,000,000
" "	1,000,000
" "	1,000,000
Chemnitz	1,000,000
Crewe	1,250,000
Colonial Gas Works Co	100,000
Cadiz	300,000
Charlottenburg	600,000
Dudley	750,000
Driffield	100,000
Dukenfield	500,000
Dover	750,000
"	1,000,000
Deal	200,000
Derby	1,500,000

	Capacity. Cubic feet per day.
Dublin	3,000,000
Dowlais	100,000
Douai	500,000
Denton	500,000
Derby, U.S.A	350,000
Denver, "	500,000
" "	1,000,000
Dusselldorf	750,000
"	500,000
Dumfries	250,000
Dunedin, N.Z	400,000
Darlington	1,250,000
Detroit, U.S.A	750,000
Edinburgh	1,500,000
"	2,000,000
Enfield	300,000
Essen	300,000
Elbing	150,000
Falmouth	150 000
Frankfort	300,000
Farnworth	400,000
Fenton	400,000
Friedenshutte	500,000
Furth	400,000
Freiburg	200,000
Goole	250,000
Glossop	300,000
Guildford	300,000
Gloucester	1,250,000
Gera	300,000
Grafton, N.S.W	100,000
Grieg	300,000
Georgetown, U.S.A	250,000
Gluckauf	200,000
Heywood	600,000
Holywood	125,000
Huy	70,000
Harrow	250,000
Harrogate	250,000
Halstead	150,000
Heilbronn	200,000
Havana, Cuba	750,000
Hastings	1,500,000
Huddersfield	300,000
"	750,000
"	1,500,000
Hof	200,000
Hampton Wick	500,000
Heckmondwicke	500,000
Haverfordwest	100,000
Halifax, N.S.	350,000
Hamm	200,000
Halle	400,000
Heidelberg	300,000
Hartford, U.S.A	1,000,000
Ilkeston	300,000
Inverness	250,000
Ilkley	200,000
Ilford	100,000
Kingston-on-Hull	400,000
Kidderminster	750,000
Kidsgrove	100,000
Konigberg	1,000,000
King's Lynn	300,000

LONDON:—

The Gaslight and Coke Co.:	
Beckton	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	2,500,000
"	2,500,000
Silvertown	1,000,000
Bromley	2,000,000
"	1,500,000
"	1,500,000
"	1,500,000
"	2,000,000
"	1,500,000

LONDON—*Continued.*	Capacity. Cubic feet per day.
Shoreditch	2,500,000
Pancras	1,500,000
"	1,500,000
Pimlico	2,000,000
Nine Elms	3,000,000
"	3,000,000
South Metropolitan Co:—	
Greenwich	3,000,000
Woolwich	400,000
Vauxhall	3,000,000
"	3,000,000
Lea Bridge	300,000
West Ham	1,500,000
Leeds	2,000,000
"	3,000,000
"	3,000,000
"	3,000,000
"	3,000,000
"	2,000,000
Leominster	150,000
Leiden	560,000
"	600,000
Liverpool	2,000,000
"	2,000,000
"	2,000,000
"	2,000,000
"	2,000,000
"	3,000,000
Lincoln	1,000,000
"	600,000
Lowell, U. S. A	1,000,000
Louisville "	1,500,000
Long Eaton	500,000
Lilie	900,000
"	450,000
"	750,000
"	250,000
"	250,000
Luckenwalde	330,000
Liegwitz	300,000
Lincoln, U. S. A	250,000
Lawrence "	500,000
Lynn "	300,000
Lyons	1,500,000
Maidstone	1,000,000
Marseilles	1,500,000
"	1,500,000
Mons	500,000
Malines	250,000
Melbourne	1,500,000
"	1,500,000
"	1,500,000
"	1,500,000
"	1,500,000
Manchester	2,500,000
Middleton	400,000
Manley, N. S. W	100,000
Minneapolis, U. S. A	750,000
Magdeburg	300,000
Memphis, U. S. A	750,000
Nottingham	1,250,000
"	2,500,000
"	2,500,000
"	2,000,000
"	1,500,000
"	2,000,000
Newport, U.S.A	430,000
Newmarket	150,000
Newark, U.S.A	680,000
Northfleet	200,000
New York, U.S.A	2,000,000
Nice	600,000
Newcastle, N. S. W.	200,000
Numea, "	100,000
Namur	250,000
Newark	350,000
Oldbury	500,000
Otley	200,000
Oswestry	250,000

	Capacity. Cubic feet per day.
Ober Schlesian	1,500,000
Otto & Co.'s Coke Works	1,500,000
Plymouth	2,000,000
Parramatta, N. S. W	100,000
Prescott	150,000
Providence, U.S.A.	750,000
"	750,000
Plauen	300,000
"	300,000
Portsmouth	2,500,000
"	2,500,000
Pittsburgh, U.S.A.	1,500,000
Portland, "	560,000
Pawtucket, "	500,000
Quebec	250,000
Radcliffe	750,000
Rouen	250,000
Ramsgate	1,000,000
Reigate	200,000
Richmond, U.S.A	250,000
Roxbury, "	500,000
Runcorn Soap Co.	20,000
Rockhampton, N. S. W.	125,000
Richmond	1,500,000
Reading	2,000,000
Reichenbach	200,000
Salford	1,750,000
"	1,750,000
"	1,750,000
Smethwick	750,000
Sydney, N. S. W	1,000,000
"	1,000,000
"	2,500,000
"	50,000
"	50,000
Sunderland	1,500,000
St. Josephs, U.S.A	250,000
Spa	100,000
Sevenoaks	300,000
St. Petersburg	2,000,000
"	1,500,000
St. Louis, U.S.A	2,000,000
"	2,000,000
"	1,000,000
Laclede	1,000,000
Silesian Coal Co.	600,000
San Francisco, U.S.A	2,000,000
"	2,000,000
Sheepbridge Coal Co.	40,000
Stettin	200,000
Singapore	300,000
Sutton	500,000
Tonbridge	150,000
Tipton	400,000
Tottenham	1,000,000
Toledo, U.S.A	750,000
Toronto	1,000,000
Uxbridge	300,000
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"	600,000
Wellington	150,000
Warwick	300,000
Wheeling, U.S.A	500,000
Walker	300,000
Westgate	100,000
Wilmington, U.S.A	500,000
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Wolverton	100,000
Wellington, N. Z.	250,000
Whitchurch	175,000
Washington, U.S.A	2,000,000
Wallasey	750,000
Weimar	150,000
Wurzen	200,000
Worcester, U.S.A	750,000
Yeadon	500,000
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Illinois Light, Heat & Power Co.	Chicago, Ill
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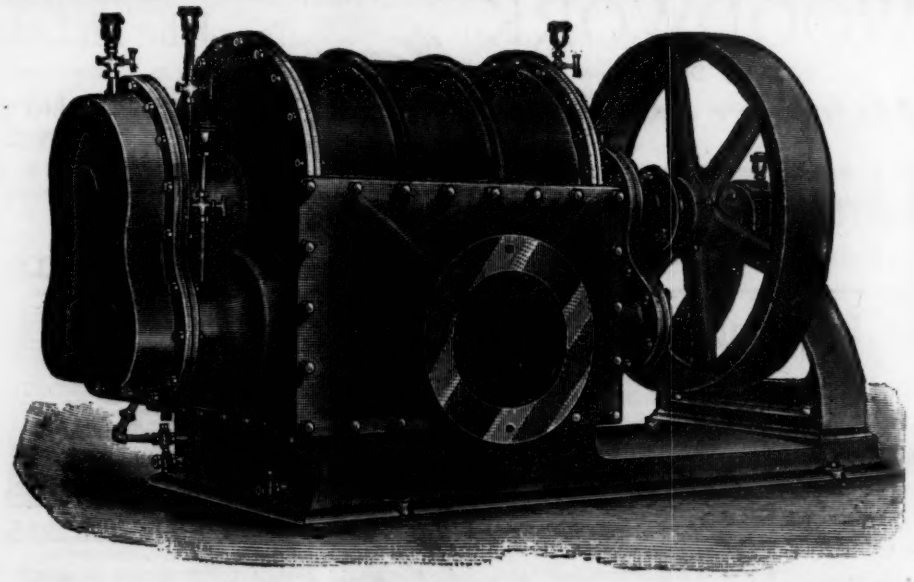

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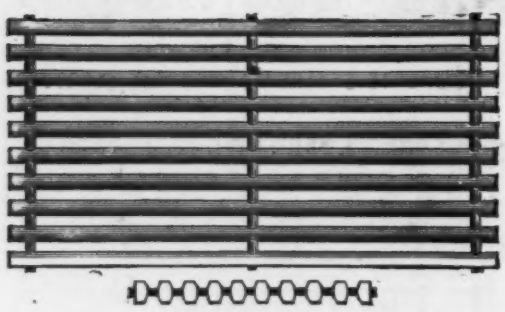

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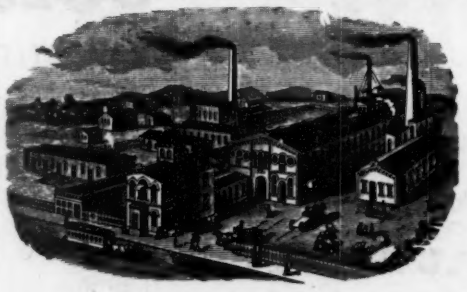

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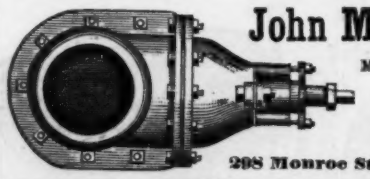

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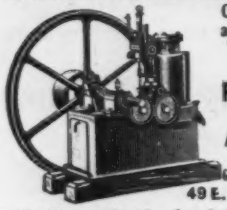

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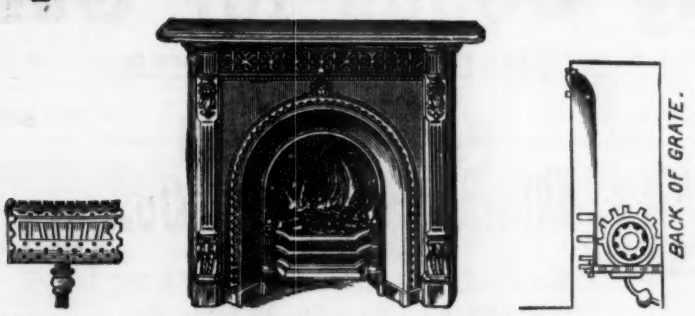

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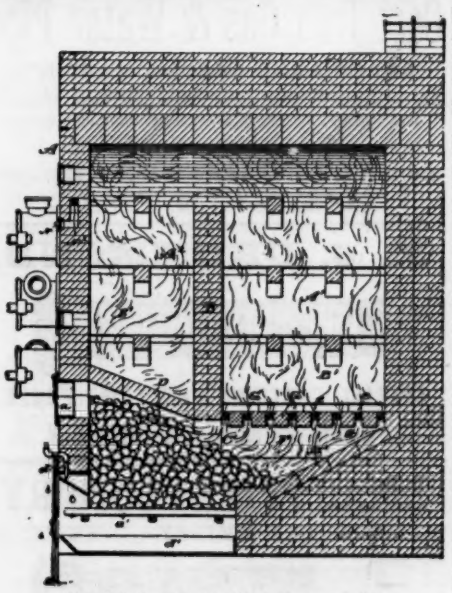

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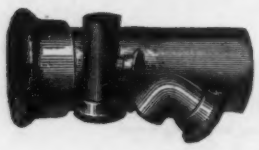

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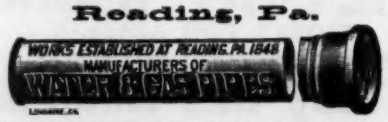

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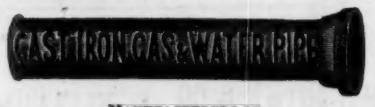

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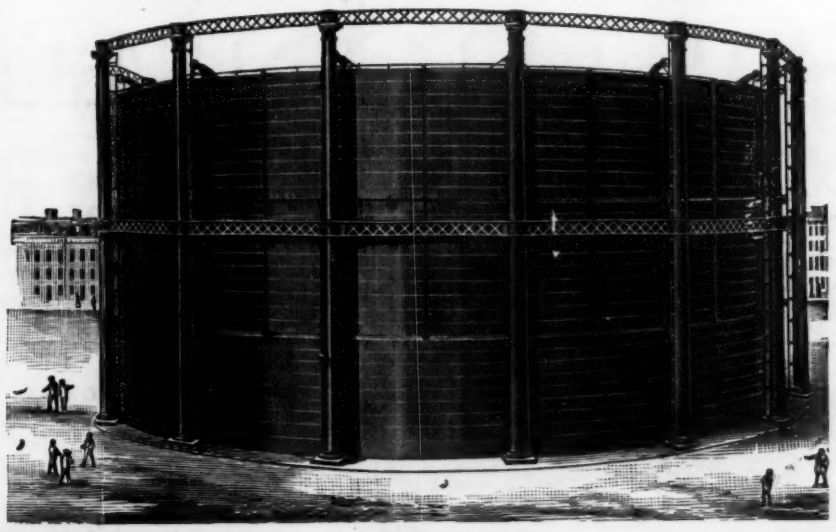

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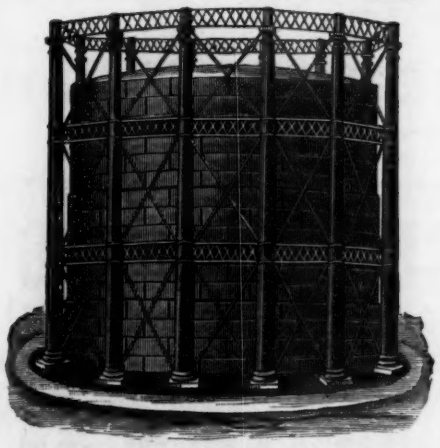

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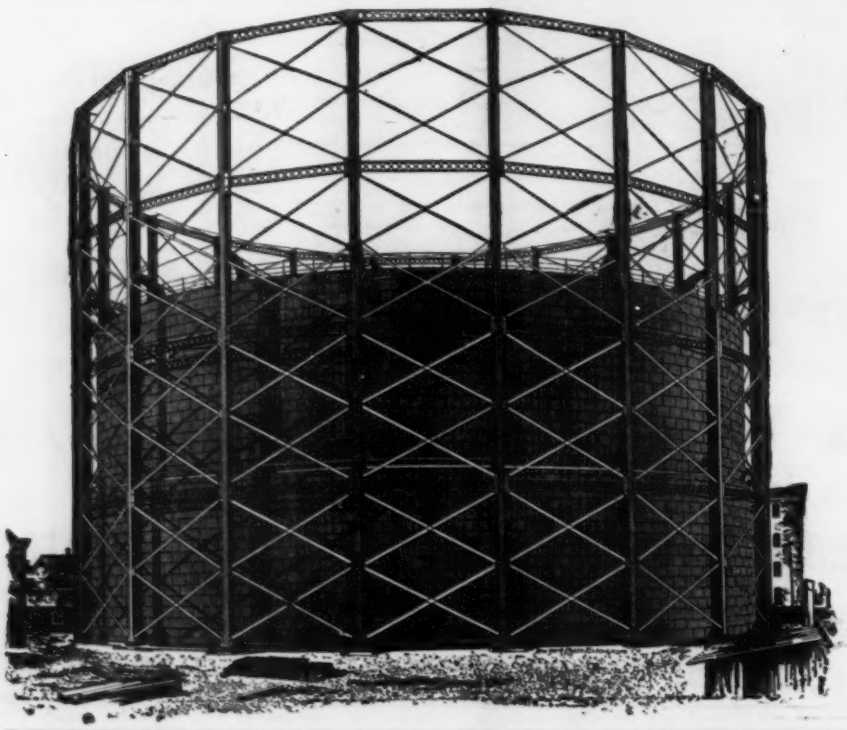

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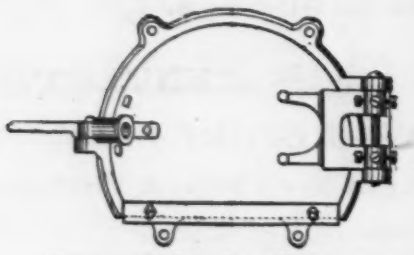

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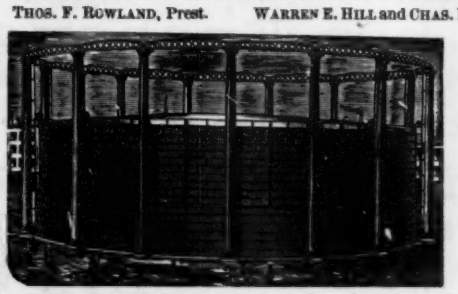

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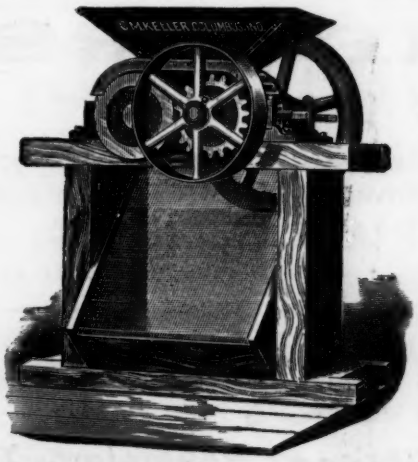

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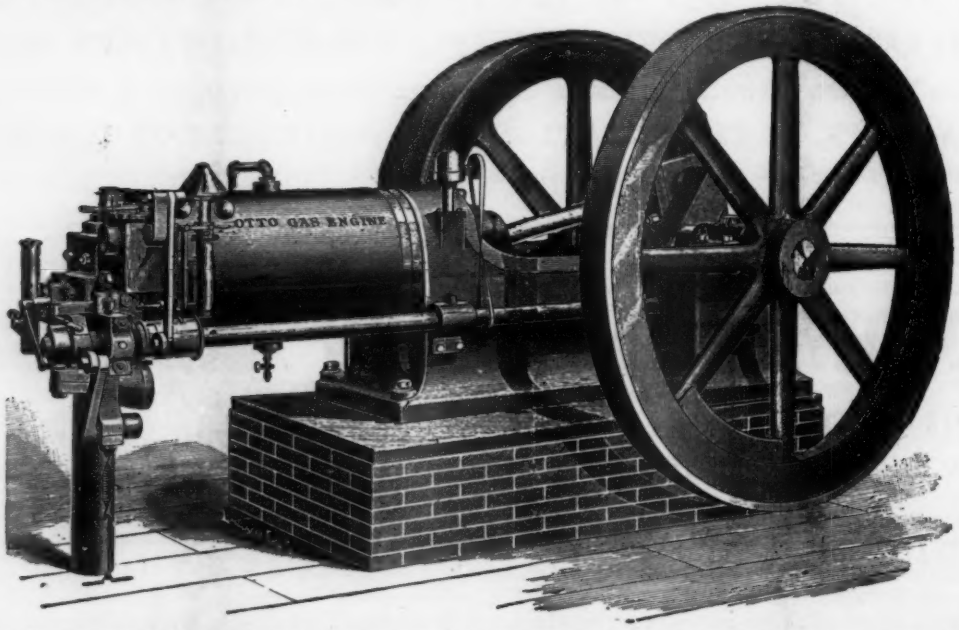

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